Molecular determination of grey seal diet in the Baltic Sea in relation to the current seal-fishery conflict

Kroner, Anne-Mette; Tange Olsen, Morten; Kindt-Larsen, Lotte; Larsen, Finn; Lundström, Karl

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MARINE CONSERVATION
FORGING EFFECTIVE STRATEGIC PARTNERSHIPS

THE 32ND CONFERENCE OF THE EUROPEAN CETACEAN SOCIETY

LA SPEZIA, ITALY

6th April to 10th April 2018

CONFERENCE PROGRAMME

eulabor institute

European Cetacean Society

WATERREVOLUTION

Città della Spezia
MEDAGLIA D'ARGENTO AL VALOR MILITARE
MEDAGLIA D'ORO AL MERITO CIVILE

Photo: C. Lanfredi

Abstract book of the 32nd Annual Conference of the European Cetacean Society

Edited by: Vienna Eleuteri, Simone Panidaga, Masha Stroobant

Eulabor Institute

Tethys Research Institute

European Cetacean Society

CARBON NEUTRAL - NO PLASTIC CONFERENCE

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Photo: C. Unger

ACKNOWLEDGEMENTS

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Città della Spezia
MEDAGLIA D'ARGENTO AL VALOR MILITARE
MEDAGLIA D'ORO AL MERITO CIVILE

Autorità di Sistema Portuale del Mar Ligure Orientale
Porti di La Spezia e Marina di Carrara

CRÉDIT AGRICOLE

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POLO UNIVERSITARIO G.MARCONI
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SEA FUTURE
SEE INNOVATION
EXHIBITION & BUSINESS CONVENTION
LA SPEZIA NAVY BASE 19-23 JUNE

WATEREVOLUTION

Artemisia serviziculturali

PAGE SERVICE

Mamberto

LA BIRETA

PR iscilla

GENERAL INFORMATION

THEME

The scientific and conservation community urges the world to develop innovative partnerships to accelerate and secure new long-term funding for sustainable ocean management (a), to apply and improve environmental standards and transparency in supply chains that influence the oceans and to harness the unique skill set of the business and private sector (b) to help addressing the challenges that our 'blue planet' is facing.

The variety and scale of challenges is increasing year on year. We now know more than we have ever known about the ocean and we have made good political progress to recognise the need to protect the marine ecosystem but we need now to accelerate innovation to get ahead of the curve.

There is growing recognition amongst a broader set of ocean partners, including industry, that many ocean values are at risk with a huge impact on the entire ecosystem of the seas and the future of marine mammals, and that because of the sheer scale of loss, we are increasingly in this together.

In light of this recognition and overall awareness of the need to work together toward a common agenda, the United Nation's 17 Sustainable Development Goals were adopted by the international community (c).

The achievement of effective marine conservation measures requires today more than good science and the theme of the 2018 ECS Conference is intended to help explore the role that partnerships with all other stakeholders have in this.

Participants in the 2018 Conference were encouraged to develop presentations that relate to this theme or otherwise consider how this issue affects their work, although as usual scientific submissions on all issues relating to marine mammals were welcome. Keynote speakers will help to elaborate the theme along with special focal sessions.

On behalf of the Conference Organising Committee, I welcome you to enjoy a very special place where cross-sectorial strategic partnerships for marine conservation are already a fact!

Vienna Eleuteri

Chair of the Conference Organising Committee

(a)The Times Funds Are Needed for Marine Protected Areas: http://bit.ly/1KkCRAe

(b) The Promise of Sydney: Innovative approaches for change

http://worldparkscongress.org/downloads/approaches/ThemeM.pdf

(c) United Nations Division for Sustainable Development, 2015, Transforming our world: the 2030 agenda for sustainable development

CONFERENCE VENUE

The conference venue for the 32nd Annual Conference 2018 is Teatro Civico in La Spezia.

The Civic Theatre was created by a deconsecrated church during the period of Ligurian Republic.

It was realized by the neoclassicist architect Ippolito Cremona and inaugurated the 18 July 1846. After some changes made at the end of the century, in 1933 it was demolished to be replaced by a new theatre building meeting new needs and designed by the famous architect Franco Oliva. Today it is again a cultural lighthouse and the center of performing arts in La Spezia.

INTERNET CAFÉ

You're the most welcome for free internet access and drinks at the ECS Conference dedicated internet café at Salvador Allende Center in Viale Mazzini 2.

Between the the historic centre of La Spezia and the harbour you'll find the public gardens, where marble statues spring up among a diversity of exotic trees and bushes. The public gardens are placed on a landfill from the construction of the military arsenal and the cultural center Salvador Allende is hosted right there close to the Passeggiata Costantino Morin (waterfront promenade).

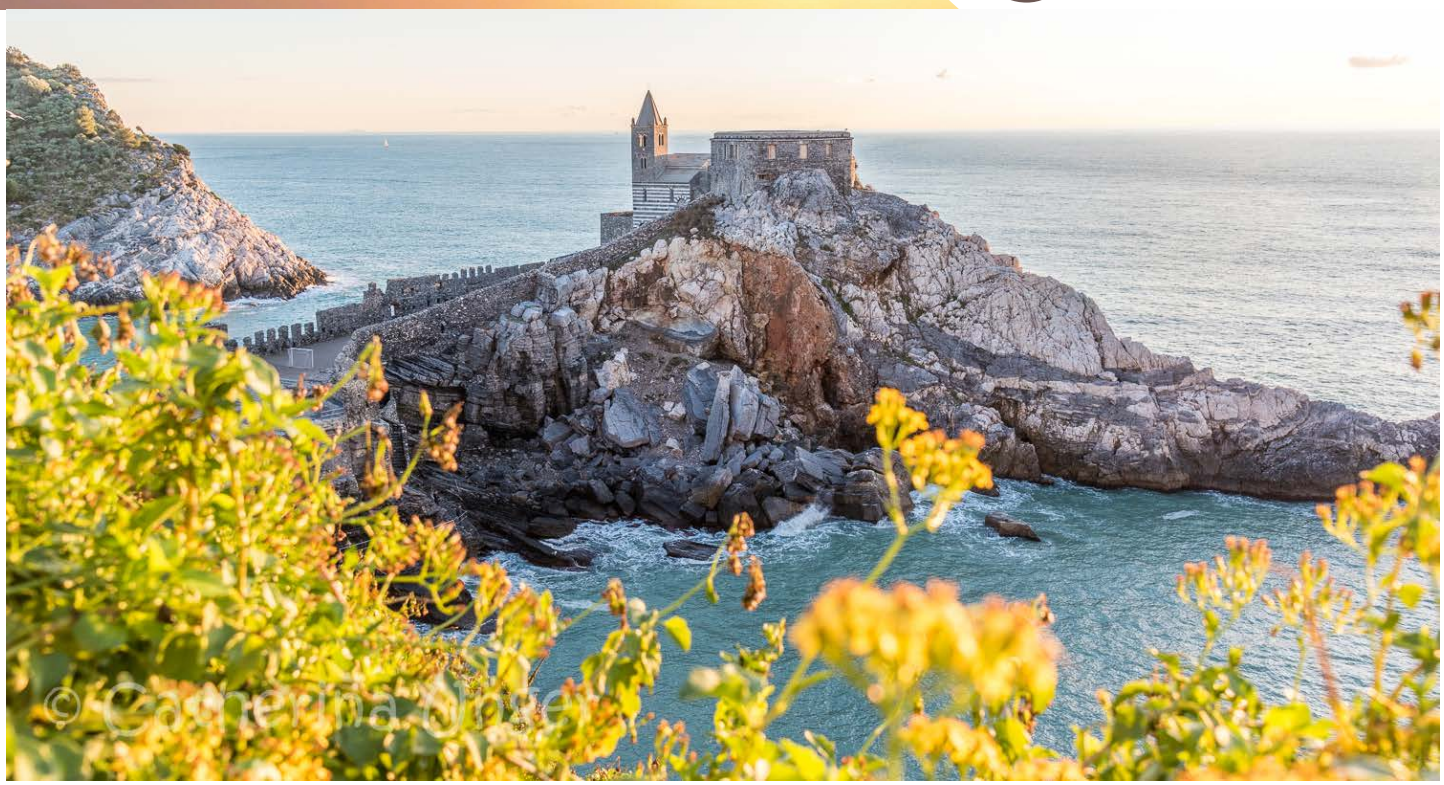


Photo: C. Unger

LA SPEZIA

At the very heart of the Pelagos Sanctuary for Mediterranean Marine Mammals

La Spezia (The spice) is a gateway to the Cinque Terre, one of Italy's most beautiful environmental spots along the Ligurian coast. It is a quiet and tourist free city and a good place to start when exploring the area.

La Spezia is into the Cinque Terre Region and a sea protected area right in the heart of the Pelagos Sanctuary for Mediterranean Marine Mammals.

Sidling up to the exquisite Lerici, Tellaro and Portovenere , this important port town and home to Italy's largest naval base is hugely atmospheric with plenty of cosy trattorias showcasing the Ligurian kitchen's finest.

Beaches overlooking a crystal-clear sea, spectacular views, a marvelous artistic legacy, and small villages set within green valleys, alive with ancient traditions: all this and much more await the visitor in the Province of La Spezia.

La Spezia is a phenomenal town for eating out with an eclectic choice of high quality restaurants at absolutely reasonable price. Most of them are located in the narrow streets west of Via del Prione, which are crowded with people going out for a bite and a drink in the evenings.

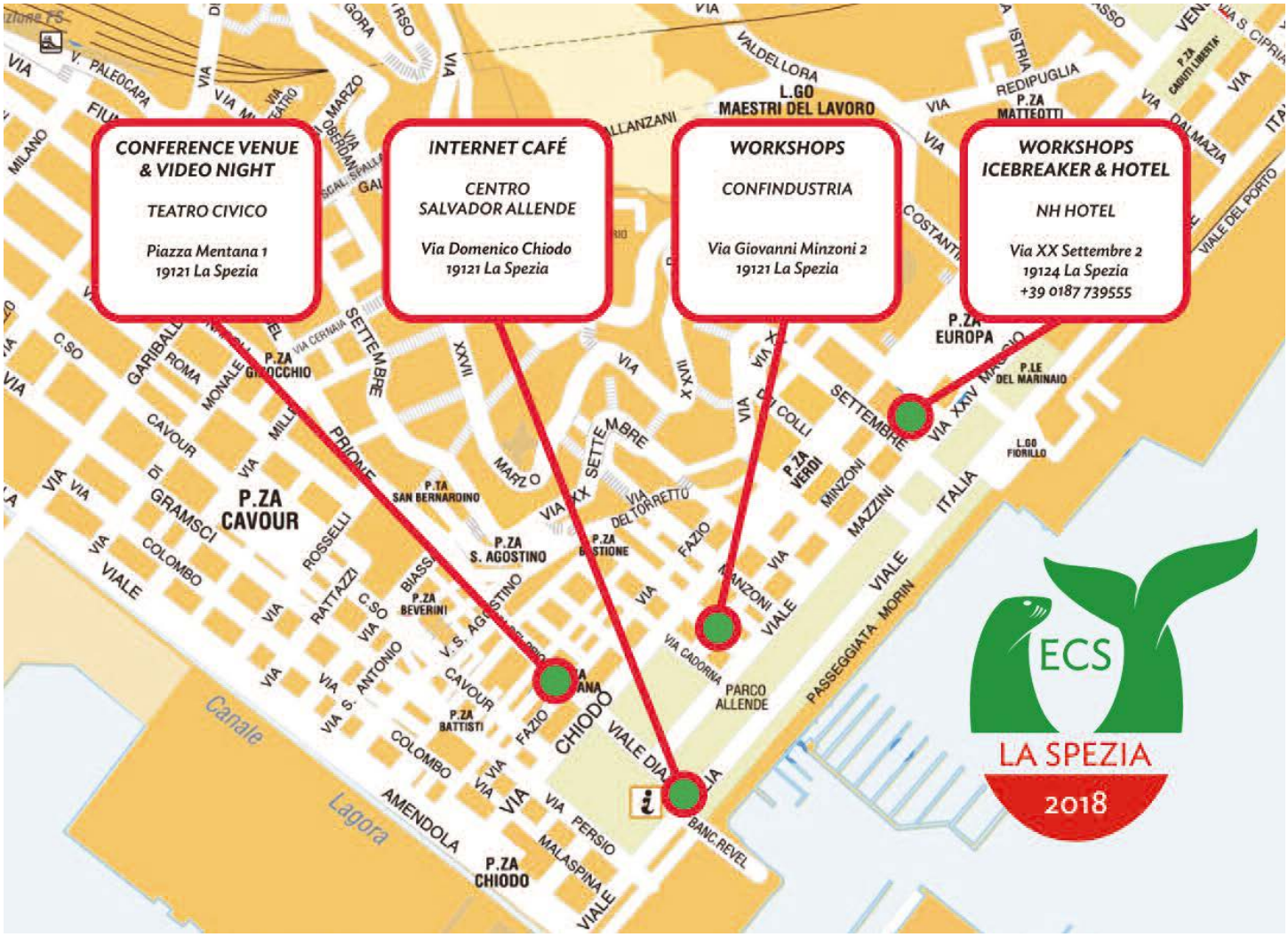
https://italiannotes.com/things-la-spezia/

The municipality of La Spezia is also at the very center of:

- The WATEREVOLUTION model for the Mediterranean Sea with a clear focus on the *Pelagos Sanctuary for Mediterranean Marine Mammals* - it represents a concrete example that nature conservation and human progress are not mutually exclusive.
- One of the largest and richest natural and cultural land and sea protected areas systems in Europe.

We´re very proud to welcome you at the 32nd Conference of the European Cetacean Society in La Spezia!

MAP



MAP, cont.

CAMeC - Modern and Contemporary Art Center	Piazza Cesare Battisti, 1, 19124 La Spezia	Local students permanent ECS art work exposition
La Rada Porto Lotti	Viale S. Bartolomeo, 394, 19126 La Spezia	Banquet and dancing
Porto Mirabello	www.portomirabello.it/en/	Restaurants, bars, sailing and whalewatching boats
Consorzio Marittimo Turistico	Passeggiata Constantino Morin, 2, 19121 La Spezia www.navigazionegolfodeipoeti.it	Liner shipping Gulf of Poets and 5 Terre
Associazione per il mare	http://associazioneperilmare.it/en/boat-tour/	Moby Dick, motor boat (15m)
DE LISI INDICA wine bar	Via Aulo Persio Flacco, 2 - 19121 La Spezia	Student party, bar, wine, eatery
PSE grafica e stampa	Via Colombo, 98/100, 19121, La Spezia Mobile: +39 347 4313678 - Elena - info@psesrl.org	Posters printing
La Pia Centenaria	Via Magenta, 12, 19121 La Spezia www.lapia.it/	The best pizza and focaccia in town since 1887
Stazione Centrale - Central Station	Piazzale Medaglie d'Oro al Valor Militare, 23 La Spezia	Train, taxi, bus, garage
ATC	https://www.atcesercizio.it/index.php/it/	Public transport

CDH Hotel	Via XX Settembre, 81 - 19122 La Spezia Ph. +39 0187 738848 - laspezia@hotelcdh.com	Hotel
Castello San Giorgio	Via XXVIIMarzo, 19121 La Spezia www.museodelcastello.spezianet.it	Castle, museum, beautiful terrace overlooking the sea
Technical Naval Museum	Main entrance of the Naval Arsenal Via Giovanni Amendola,1 - 19122 La Spezia	Naval museum
Lia Art Museum	Via del Prione, 234 - La Spezia	Art museum in the ancient monastery of the Friars Minor of St. Francis of Paola
5 Terre National Park and Marine Protected Area	http://www.parconazionale5terre.it/page.php?id=93	Nature and territory, UNESCOWorld Heritage
Portovenere	https://portovenere.a-turist.com/portovenere	Site of world heritage
Lerici	http://cinqueterreandbeyond.com/lerici/lerici-castle/	Nature and territory
Presidio Ospedaliero La Spezia	Via Vittorio Veneto, 197, La Spezia Ph. +39 0187 5331 **EMERGENCY 118**	Hospital

USEFUL INFORMATION

IMPORTANT CONTACTS

Emergency number: 112

International phone code for Italy: +39

Hospital (La Spezia): 118

Local police: +39 0187 5671

Closest pharmacy: Farmacia Bonaschi, Piazza Mentana, 9 - +39 0187 738159 (Open 8:30 – 12:30; 15:30 – 19:30)

Pharmacy **Open on Sunday 8th**: Farmacia Argentieri, via Vittorio Veneto 117 – 8:30 -19:30

+39 0187 511179

TAXI : +39 0187 523523

POSTERS

Attachment: Posters must be hung using tacks that will be made available by the conference organizers from Saturday (7th April) registration onwards.

Puting up and taking down posters: Posters can be hung on Saturday while the registration desk is open (4 PM to 6:30 PM) and on Sunday morning. Posters must be taken down after the lunch break and not later than 3 p.m. on Tuesday (10 April).

ICEBREAKER

The icebreaker will be held in the main salon at the first floor at NH Hotel. Free tickets at the main entrance at NH Hotel. The building will be identified with the conference logo.
Local finger food and drinks will be served during the evening. Vegetarian choices will be also available.
The icebreaker is kindly supported by Eulabor Institute.

Address: Via XX Settembre 2, 19124 La Spezia

STUDENT PARTY

Monday night is student party night. This year's student party will take place at DE LISI wine bar close to the public gardens in Downtown La Spezia. The party starts at 21. You can walk directly from the Salvador Allende Cente (internet cafè) or from the Civic Theatre/city center to the bar in less than two minutes.The wine-bar serves delicious cocktails and drinks. Lots of space for all kinds of socializing and plenty beautiful outdoor garden area. So bring all your colleagues, even if they are not students.

Address: Via Aulo Persio Flacco, 2, 19121 La Spezia

DINNER AND DANCING

The Conference banquet will take place at La Rada Restaurant in Porto Lotti (Lotti Harbor) with an amazing view of the Poets' Gulf and fabulous food, the italian best specialities from Liguria.

The meeting point for the banquet pick up will be at Ferry Terminal *'Consorzio Marittimo Turistico 5 Terre',* Passeggiata Costantino Morin, 19121 La Spezia, at 19:20.
If you have not bought access beforehand, please contact the conference help desk as soon as you can.

At 22, the banquet will be followed by dancing and DJ session. The bus pick-up meeting point will be at 21:45 in Piazza Chiodo, 19121 La Spezia.
Starting from 23:00 until 02:00AM, buses will be available for pick-up from Porto Lotti to Piazza Chiodo.

Address: Viale S. Bartolomeo, 394, 19126 La Spezia

COFFEE/LUNCH BREAKS

A coffee station with coffee, soft drinks and snacks is always available for free at the Conference venue (Civic Theater) and the internet café in Salvador Allende Center. But do not miss the restaurants, pizzeria&focacceria, bars all around close to the Civic Theatre.

CONFERENCE PROGRAMM

Photo: M. Vighi

SUNDAY 8TH APRIL

7:45	8:29	**Registration**
8:30	9:29	**Opening of the Conference** - The Chair of the ECS, the Chair of the Organizing Committee, the Chair of the Scientific Committee, Intergovernmental Oceanographic Commission of UNESCO, Permanent Secretariat of the Pelagos Agreement, ACCOBAMS Welcome by local authorities, Mario Acquarone, Vienna Eleuteri, Simone Panigada, Francesca Santoro, Costanza Favilli, Florence Descroix-Comanducci ('Launching of the ACCOBAMS Survey Initiative')
9:30	9:49	**Opening talk** by Giuseppe Notarbartolo di Sciara
9:50	9:59	**Questions and answers**
		First session: HABITAT & DISTRIBUTION - Chair1: Mario Acquarone Chair2: Margherita Zanardelli
10:00	10:14	**Sergi Pérez-Jorge** - Environmental drivers of the large-scale movements of baleen whales in the mid-Atlantic Ocean.
10:15	10:29	**Arianna Azzellino** - Time matters. Why we should consider more the temporal resolution of our studies.
10:30	10:44	**Filipe Alves** - Biogeographical patterns of short-finned pilot whales in the Northeast Atlantic: in the search of an optimal habitat.
10:45	11:14	**Coffee break**
		Second session: HABITAT & DISTRIBUTION - Chair1: Tilen Genov - Chair2: Arianna Azzellino DENSITY & ABUNDANCE
11:15	11:29	**Alexandre Gannier** - Describing favourable habitats of western Mediterranean teuthophageous species.
11:30	11:44	**James Waggitt** - Ecologically informed and dynamic distribution maps for cetacean communities in the north-eastern Atlantic Ocean.
11:45	11:59	**Auriane Virgili** - Would habitat models for deep-diving cetaceans be improved if prey distributions were included?
12:00	12:14	**Caterina Lanfredi** - Abundance assessment of sperm whales (Physeter macrocephalus) in the North-Western portion of the Pelagos Sanctuary (NW Mediterranean Sea)
12:15	12:29	**Silvia Bonizzoni** - Predicting dolphin distribution within an Important Marine Mammal Area (IMMA) in Greece to support spatial management planning.
12:30	12:44	**Simone Panigada** - The ACCOBAMS Survey Initiative – when a dream comes true.
12:45	14:29	**Lunch break/student AGM**

		Third session: BEHAVIOUR & ECOLOGY - Chair: Doug Nowacek - Chair2: Cristina Fossi
14:30	14:44	**Lorenzo Fiori -** Assessing the effects of humpback whale-based tourism in Vava'u, Kingdom of Tonga: Behavioral responses of whales to vessels and in-water tourism activities.
14:45	14:59	**Charlotte Lambert** - A story of size and depth: predator-prey interactions in the Bay of Biscay
15:00	15:14	**Ewa Krzyszczyk** - Dolphin-Shark Interactions: Responses to Predation Risk and Non-Lethal Attacks
15:15	15:29	**Aylin Akkaya Bas** - Marine traffic alters the behavioural budget of bottlenose dolphins in the Istanbul Strait, Turkey
15:30	15:44	**Valeria Senigaglia** - Long-term effects of food provisioning on the reproductive success of free-ranging bottlenose dolphin population
15:45	15:59	**Janet Mann** - Sex Bias, Social Preferences and Social Learning in Bottlenose Dolphin Tool-Use
16:00	16:59	**POSTER SESSION WITH COFFEE** - EVEN NUMBERS
17:00	17:44	**Keynote speaker** - Spyros Kotomatas - Chair: Giuseppe Notarbartolo di Sciara
17:45	17:49	Questions and answers
		Short Talk: MANAGEMENT & CONSERVATION - Chair1: Lars Bejder Chair2: Daniela Silvia Pace
17:50	17:54	**Antonella Arcangeli** - Whales in a rubbish sea - a regional cooperative project to help monitoring litter impact on cetaceans in the Mediterranean Sea
17:55	17:59	**Kristina Steinmetz** - Enhancing pinniped management and conservation via stakeholder engagement and non-invasive genetic sampling
18:00	18:04	**Bianca Unger** - Possible conflict areas between harbour porpoises and floating debris in the German North and Baltic Seas
18:05	18:09	**de Francesco Maria Carla** - Towards the identification of 'Units for Conservation' for bottlenose dolphin Tursiops truncatus (Delphinidae, Cetacea) in European waters.
18:10	18:14	**Jonas Teilmann** - Fishermen help scientists reveal far reaching movements of minke whales from coastal North Sea to deep Atlantic habitats
18:15	18:19	**Maja Nimak-Wood** - Marine mammal observer data - unexpectedly finding missing pieces of puzzles and helping scientists build a bigger picture about blue whales in the Indian Ocean
18:20	18:24	Francesca Santoro - Protecting marine mammals in crwoded waters
18:25	19:25	**POSTER SESSION** - EVEN NUMBERS
21:00	23:00	**VIDEO NIGHT at Teatro Civico**

Photo: C. Unger

MONDAY 9TH APRIL

		First session: MANAGEMENT & CONSERVATION - Chair1: Spyros Kotomatas Chair2: Michela Podestà GENETICS/EVOLUTION
8:45	8:59	**Karen Stockin** - Wildly irresponsible or responsible for the wild? An urgent call for welfare science at whale mass strandings
9:00	9:14	**Alejandra Vergara-Pena** - Can codes of conduct limit impacts of vessel traffic upon bottlenose dolphins?
9:15	9:29	**Ludovic Hoarau** - Is there hope for sustainable whale watching and swim-with whales in Reunion Island, Indian Ocean? Recreational and professional regulations during the last humpback whale (Megaptera novaeangliae) breeding season
9:30	9:44	**Michael James Tetley** - The growing Important Marine Mammal Area (IMMA) Network: an update on the global process for informing the management practices of place-based marine conservation
9:45	9:59	**Guido Parra** - Low genetic diversity, limited gene flow and widespread genetic bottleneck effects in a threatened dolphin species, the Australian humpback dolphin
10:00	10:14	**Tjibbe Stelwagen** - Genetic evidences of population decline in the harbour porpoise from Iberia waters over the last 30 years
		Short Talk: HABITAT & DISTRIBUTION - Chair1: Aviad Scheinin - Chair2: Anita Gilles
10:15	10:19	**Clare Embling** - Oceanographic drivers of sperm whale distributions off the west coast of Scotland
10:20	10:24	**Thibaut Bouveroux** - Modelling fine-scale distribution and density of harbour porpoises in the Southern Bight of the North Sea inferred from platform-of-opportunity data
10:25	10:29	**Nadya C. Ramirez Martinez** - Modelling cetacean habitat use in Norwegian waters
10:30	10:34	**Elisa Remonato** - Where are the Risso's dolphins (Grampus griseus) of the North Western Mediterranean Sea? Study of Movements Within and Outside the Pelagos Sanctuary.
10:35	10:39	**Clàudia Auladell Quintana** - Beaked whale distribution and habitat use from acoustic surveys in the North-East Atlantic.
10:40	11:09	coffee break
11:10	11:54	**Keynote speaker** - Cristina Fossi - Chair: Vienna Eleuteri
11:55	12:09	Questions and answers
		Second session: MANAGEMENT & CONSERVATION- Chair1: Joan Gonzalvo Chair2: Léa David
12:10	12:24	**Mark Simmonds** - Animal Sentience as a Key Issue in Marine Mammal Science and Policy in Europe.
12:25	12:39	**Arne Bjørge** - Is the use of acoustic alarms on gillnets the quick fix for fisheries with high bycatch rate of harbour porpoises?
12:40	12:54	**Cecilia Passadore** - Ecogeographic and anthropogenic drivers of dolphin distribution: informing future spatial conservation planning in a marine protected area.
12:55	13:09	**Lars Bejder** - Low energy expenditure and resting behaviour of humpback whale mother-calf pairs highlights conservation importance of sheltered breeding areas
13:10	14:54	**Lunch break/Vaquita special event, Lorenzo Rojas- Bracho**
		Short Talk: DENSITY & ABUNDANCE - Chair1: Giancarlo Lauriano - Chair2: Rebecca Boys
14:55	14:59	**Nino Pierantonio** - Occurrence and abundance of delphinids in the Northern Aegean Sea from aerial surveys
15:00	15:04	**Roma Banga** - Through the sealing: Grey seal pup numbers increase in North Wales

		Short Talk: MANAGEMENT & CONSERVATION NEW TECHNIQUES - Chair1: Antonio Fernandez - Chair2: Ayaka Amaha Öztürk ACOUSTIC & NOISE - HEALTH & MEDICINE
15:05	15:09	**Begüm Uzun** - Genetic investigation on the population structure of the harbour porpoises living in Turkish waters by double digest restriction associated DNA (ddRAD) sequencing
15:10	15:14	**Pauline Couet** - A simultaneous estimation of female and calves survival and breeding probability using multievent capture-recapture data.
15:15	15:19	**Bénédicte Madon** - Tech4Whales: Towards Real-time, High Resolution Navigational Software for Whale Avoidance
15:20	15:24	**Pablo Chevallard** - Kinematic and acoustic analysis of herring-eating killer whale feeding behaviour during different prey life-stages
15:25	15:29	**Rosie Williams** - Long-Term Temporal and Spatial Patterns of Polychlorinated Biphenyls in UK Harbour Porpoises (Phocoena Phocoena)
15:30	15:34	**Olga Novillo** - Presence of microplastics in the digestive tract of stranded cetaceans from the Western Mediterranean.
15:35	15:39	**Steffen De Vreese** - Preliminary findings on the morphology of the peripheral nervous system of the external ear canal in odontocetes
15:40	15:44	**Eyal Bigal** - Toxoplasmosis and Herpesvirus in common bottlenose dolphins (Tursiops truncatus); a first report from the Eastern Mediterranean Sea
		Third session: HEALTH & MEDICINE
15:45	15:59	**Tilen Genov** - Severe injuries as a conservation concern: evaluating the population-level effects of cryptic events on a coastal dolphin population
16:00	16:14	**Iben Stokholm** - Origin and spread of phocine distemper virus in 1988 and 2002
16:15	16:29	Carla Grattarola - The Western Mediterranean basin like a pathogens soup? A source of growing concern for cetacean species inhabiting the Pelagos Sanctuary
16:30	17:29	**POSTER SESSION WITH COFFEE** - ODD NUMBERS
		Fourth session: NEW TECHNIQUES - Chair1: Enrico Pirotta - Chair2: Caterina Lanfredi
17:30	17:44	**Yann Planque** - Harbour and grey seals'foraging ecology in the Eastern English Channel highlight potential competitive trophic interactions.
17:45	17:59	**Oliver O'Cadhla** - From basis to Basins: Ireland's ObSERVE Programme as an Effective Strategic Partnership
18:00	18:14	**Simon Berrow** - OBSERVE-ACOUSTIC: strategic partnerships between government departments and research providers deliver a large scale, offshore, multi-annual acoustic survey off Western Ireland
18:15	19:15	**POSTER SESSION** - ODD NUMBERS
		STUDENT PARTY

TUESDAY 10TH APRIL

		First session, Chair1: Gianni Pavan - Chair2: Masha Stroobant **ACOUSTIC & NOISE**
8:45	8:59	**Edda Elísabet Magnúsdóttir** - The importance of a subarctic feeding ground for humpback whale song transmission to subtropical breeding grounds in the North Atlantic Ocean
9:00	9:14	**Laela Sayigh** - Acoustic cues associated with cetacean mass stranding events
9:15	9:29	**Clare Owen** - Migratory convergence allows simultaneous cultural convergence and transmission of humpback whale song across the South Pacific
		Short Talk: BEHAVIOUR & ECOLOGY - Chair1: Aviad Scheinin - Chair2: Anita Gilles **EVOLUTION & DEVELOPMENT - NEW TECHNIQUES**
9:30	9:34	**Eva Prendergast** - Boat traffic negatively influences diet rhythmic behaviour in harbour porpoise in Skjálfandi Bay, Iceland
9:35	9:39	**Conor Ryan** - Acoustic, genetic and observational evidence indicate the presence of humpback whales (Megaptera novaeangliae) from both hemispheres in Cape Verdean waters during their respective breeding seasons
9:40	9:44	**Rachel Davies** - Seasonality in North Sea Marine Mammals using longitudinal ECMC partner data, 2006-2016
9:45	9:49	**Kayleigh Jones** - Sexual segregation in Antarctic fur seal pups, Arctocephalus gazella
9:50	9:54	**Alberto Collareta** - Tracing the origins of the modern Mediterranean baleen whale fauna: hints from the fossil record
9:55	9:59	**Alexander Schubert** - A comparison of high-resolution digital aerial surveys and passive acoustic monitoring
10:00	10:04	**Aviad Scheinin** - Delphis – a Modern Technology and Open Standards for Coastal Cetacean Surveying Application
10:05	10:09	**William Kay** - From brick to bullet: Using Computational Fluid Dynamics to design bio-logging tags with minimal drag
10:10	10:14	**Felix Matthies** - A simple method to obtain reliable estimations of dolphins group size
10:15	10:59	**COFFEE BREAK/ poster viewing ALL POSTERS**
		Second session: NEW TECHNIQUES - Chair1: Sandro Mazzariol - Chair2: Auriane Virgili **STRANDIGS - Chair1: Bruno Cozzi - Chair2: Yara Bernaldo de Quirós**
11:00	11:14	**Giancarlo Lauriano** - Satellite tagging of C-type killer whales in the Antarctic: insights toward the Ross Sea Region conservation objectives.
11:15	11:29	**Rebecca M Boys** - Multi-state open robust design models for dealing with incomplete sampling and imperfect detection: an example with sperm whales and opportunistic photo-id data
11:30	11:44	**Enrico Pirotta** - Assessing the population consequences of disturbance on migratory baleen whales via a dynamic state variable model of female lifetime reproductive success
11:45	11:59	**Thomas Folegot** - How much does it cost to the maritime economy to reduce collisions'risks for large whales in the Pelagos sanctuary?
12:00	12:14	**Brian Sharp** - Considering Rescue Attempts of Stranded Live Large Whales
12:15	12:29	**Raquel Puig** - Retrospective study of foreign body-associated pathology in stranded cetaceans, Canary Islands (2000-2015)
12:30	12:44	**Sandro Mazzariol** - Multidisciplinary studies on a sperm whales' mass stranding
12:45	12:59	**Stephen Marsh** - 30 years of Marine Mammal Rescue in the United Kingdom

13:00	13:59	**LUNCH BREAK/poster viewing ALL POSTERS**
14:00	14:44	**Keynote speaker** - Douglas Nowacek - Chair: Simone Panigada
14:45	14:59	Questions and answers
15:00	15:29	**Coffee break**
15:30	17:29	AGM
17:30	18:00	**AWARD CEREMONY**
19:45	22:00	**DINNER**
22:00		**DANCING**

Photo: C. Unger

LIST OF POSTERS

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Beatrice Jann(1), Mario Acquarone(2)
(1) Swiss Whale Society, Via Nolgio 3, Massagno, Ticino, CH-6900, Switzerland.
(2) Marine and Freshwater Research Institute, Reykjavik, Iceland.

AN02 Vocal repertoire of mammal-eating killer whales in Russian Far East seas
Anastasia Danishevskaya(1), Olga Filatova(2), Olga Shpak(3), Erich Hoyt(4)
(1) Izmaylovskoye shosse, Moscow, 105318, Russia.
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(4) WDCS, the Whale and Dolphin Conservation Society, North Berwick, Scotland, UK.

AN03 Do beaked whales click differently in shallow waters? Characteristics of on-axis clicks of Mesoplodon bidens recorded in the Baltic Sea
Tom Baer(1), Dr Harald Benke(2), Dr Michael Daehne(2)
(1) Friedhofsweg 11, Rostock, Mecklenburg-Vorpommern, 18057, Germany.
(2) German Oceanographic Museum, Stralsund, Germany.

AN04 Acoustic occurrence detection of a newly recorded Indo-Pacific humpback dolphin population in waters southwest of Hainan Island, China
Songhai Li, Dr. Lijun Dong
Institute of Deep-sea Science and Engineering, Chinese Academy of Sciences, 28 Luhuitou Road, Sanya, Hainan, 572000, China.

AN05 Comparing acoustic monitoring devices for odontocetes - First step: The acoustic performance in the field
Katharina Brundiers, Anja Gallus, Harald Benke, Michael Dähne
German Oceanographic Museum, Katharinenberg 14-20, Stralsund, 18439, Germany.

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Laura Ceyrac, Dr Violaine Dulau, Laurent Mouysset, Vanessa Estrade
GLOBICE NGO, 30 chemin Parc Cabris, Saint Pierre, 97410, Reunion.

AN07 Modelling the effect of air gun array noise on marine mammal communication
Benno Woelfing(1), Peter Stilz(2), Alexander Gavrilov(3), Matthias Fischer(4), Marianne Rasmussen(5,6), Max Schuster(4), Dietrich Wittekind(4), Christine Erbe(3), Prof. Ursula Siebert(5)
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(5) University of Veterinary Medicine, Hannover, Foundation, Institute for Terrestrial and Aquatic Wildlife Research, Büsum, Germany
(6) Húsavik Research Center, University of Iceland, Húsavik, Iceland.

AN08 A pulsed-air model of blue whale B calls: Implications for observed long-term decreases in call frequency
Robert Dziak(1)
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AN09 The acoustic repertoire of free-ranging bottlenose dolphins ***(Tursiops truncatus)*** **in southwest Abaco, Bahamas**
Raffaela Falkner, Prof Vincent M. Janik, Dr Charlotte Dunn
Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife, KY16 8LB, United Kingdom.

AN10 Effects Of Vessel Noise On Underwater Vocalizations Of Bottlenose Dolphins, Tursiops Truncatus, In The Sado Estuary, Portugal
Filipa Veiga Sobreira, Ana Rita Luís, Inês Sofia Alves, Prof Manuel Eduardo dos Santos
MARE - Marine and Environmental Sciences Centre, ISPA - Instituto Universitário, Rua Jardim do Tabaco, 34, 1149-041 Lisboa, Portugal.

AN11 Year-round acoustic activity of bottlenose dolphins in a high impacted coastal area of the Central Mediterranean Sea

Elena Papale(1), Dr Giuseppe Alonge(2), Dr Rosario Grammauta(3), Martina Gregorietti(3,4), Dr Maria Ceraulo(3), Dr Salvatore Mazzola(3), Dr Giuseppa Buscaino(3)
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(3) Institute for Marine and Coastal Research, National Research Council Italy.
(4) Accademia del Leviatano, Roma, Italy.

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Virginia Sciacca(1), Dr Salvatore Viola(2), Dr Francesco Caruso(2,3), Prof Giorgio Bellia(2,4), Dr Antonio D'Amico(5), Dr Francesco Filiciotto(6), Prof Gianni Pavan(7), Dr Carmelo Pellegrino(8), Dr Sara Pulvirenti(2), Dr Francesco Simeone(9), Dr Fabrizio Speziale(2), Dr Giorgio Riccobene(2)
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(8) Istituto Nazionale di Fisica Nucleare (INFN), CNAF, Bologna, Italy..
(9) Istituto Nazionale di Fisica Nucleare (INFN) - Sezione di Roma, Roma, Italy.

AN14 Measuring the size of Mediterranean sperm whales through the inter-pulse interval: comparative study of the total body length formulas

Miclaus Andreea Ioana(1), Dr Mandich Alberta(1,2), Dr Vassallo Paolo(1), Dr Petrillo Mario(1), Dr Burlando Marco(3), Dr Sanguineti Matteo(3), Dr Grosso Daniele(3), Dr Pesce Alessandra(3), Dr Cavalleri Ornella(3), Dr Gnone Guido(4), Dr Valettini Bruna(4), Dr Melchiorre Christian(5), Dr Viano Gianni(5), Prof Taiuti Mauro Gino(3), Dr Alessi Jessica(1,2,6)
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(5) Softeco Sismat S.P.A., Genoa, Italy.
(6) Associazione Me.Ri.S. Mediterraneo Ricerca e Sviluppo, Favara (AG), Italy.

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Florent Le Courtois(1), Marie Mauran(1), Dr G. Bazile Kinda(2), Dr Yann Stéphan(3), Dr Jérôme Spitz(2)
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AN17 Marine noise budgets in practice

Rebecca Faulkner, Nathan Merchant, Roi Martinez
Cefas, Lowestoft, Suffolk, NR33 0HT, United Kingdom.

AN18 Limited Combinations of Multiple Sound Units Indicate Non-Random Use of Call Combinations in Norwegian Killer Whale *(Orcinus Orca)* Vocal Repertoires

Miguel Neves dos Reis(1), Dr Filipa Samarra(2), Professor Patrick Miller(3)
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(2) Marine Research Institute Iceland - Hafrannsóknastofnun.
(3) Sea Mammal Research Unit University of St Andrews.

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(3) Portofino MPA, Genova (IT)
(4) Softeco Sismat, Genova (IT),
(5) Direzione Marittima di Genova (IT)

AN20 Structure and function of female and pup contact calls in southern elephant seals (Mirounga leonina)
Elena Baroni(1), Dr Simona Sanvito(2), Dr Filippo Galimberti(2)
(1) Via Montebuoni 83, Impruneta, Firenze, 50023, Italy.
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AN21 PAM studies from offshore Irish water collected during the Cetaceans on the Frontier Surveys 2009-2014
Cristina Otero(1), Dr Simon Berrow(2), Dr Conor Ryan(3), Dr Dave Wall(4), Dr Joanne O'Brian(2)
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AN22 Click around the clock: diurnal clicking pattern of captive harbour porpoises
Anna Natalia Osiecka, Prof Magnus Wahlberg
University of Southern Denmark, Elmelundsvej 4, 2505, Odense, 5200, Denmark.

AN23 First characterization of whistles produced by common bottlenose dolphins *(Tursiops truncatus)* of the Gulf of Ambracia, Greece
Giuseppe Sciancalepore(1), Joan Gonzalvo(2), Nino Pierantonio(2), Prof Matteo Griggio(1), Marco Bonato(1,4)
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AN24 Long-term Static Acoustic Monitoring of harbour porpoise *(Phocoena phocoena)* at the Galway Bay Marine and Renewable Energy Test Site in Ireland
Aude Benhemma-Le Gall(1), Joanne O'Brien(2)
(1) 2 Rue Rosily Mesros, BREST, 29200, France.
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AN25 Spatial orientation in acoustic presence during seasonal migration of free-ranging harbour porpoises *(Phocoena phocoena)*
Franziska Thelke(1), Anja Gallus(2), Prof. Dr. Niels Blaum(3), Dr. Harald Benke(2), Dr. Michael Dähne(2)
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(2) German Oceanographic Museum.
(3) University Potsdam.

AN26 Soft start of seismic array - time to step it up?
Patrick Lyne
Irish Whale and Dolphin Group, Disert, Castletownbere, County Cork, none, Ireland.

AN27 Intra population variability of whistles characteristics in a free-ranging bottlenose dolphins (Tursiops truncatus) population
Clémentine Séguigne, Séverine Methion, M Bruno Diaz Lopez
BDRI - Bottlenose Dolphin Research Institure, Avenida Beiramar 192, O Grove, 36980, France.

APH ANATOMY & PHYSIOLOGY

APH01 Where's the air? A novel way to find out how wild echolocating whales manage air for sound production in deep dives

Ilias Foskolos(1), Natacha Aguilar de Soto(2), Prof Peter Teglberg Madsen(3), Mark Johnson(4)
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(4) Scottish Oceans Institute, University of St Andrews, East Sands, KY16 8LB, St Andrews, Fife, Scotland, United Kingdom.

APH02 Morphological and histopathological study of the larynx of odontocete cetaceans stranded in the Canary Islands

Miguel Rivero, Simone Segura-Göthlin, Prof. Antonio Espinosa de los Monteros, Prof. Antonio Fernández, Dr. Manuel Arbelo, Dr. Eva Sierra
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APH03 Cranial nerves in dolphins

Stefan Huggenberger(1), Gisli Barthelmess(1), Prof Dr Helmut H. A. Oelschläger(2), Prof Dr Hannsjörg Schröder(1)
(1) Department II of Anatomy (Neuroanatomy), University of Cologne, 50924 Cologne, Germany.
(2) Department of Anatomy III (Dr. Senckenbergische Anatomie), Johann Wolfgang Goethe-University Frankfurt am Main, 60590 Frankfurt am Main, Germany.

APH04 Evaluation of different methodologies for the morphological analysis of the spiral ganglion of cetaceans

Tania Ramírez(1), Dr. Simona Sacchini(2), Dr. Yania Paz(2), Dr. Marisa Andrada(2), Dr. Antonio Espinosa de los Monteros(2), Dr. Manuel Arbelo(2), Dr. Eva Sierra(2), Dr. Antonio Fernández(2)
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APH05 First records of sperm whale (Physeter macrocephalus) with anomalously white pigmentation in the Tyrrhenian Sea. A living, Mediterranean Moby Dick?

Elena Fontanesi(1), Mattia Leone(1), Laura Pintore(1,2), Prof Renata Manconi(3), Dr Luca Bittau(1)
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(3) Dipartimento di Medicina Veterinaria, Università di Sassari, via Vienna - 07100 Sassari (Italy).

APH06 Dynamic of dentin and cement deposited on vestigial teeth of the Pacific walrus

Natalia Kryukova
Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), Moscow, Russia, Verkhnaya Krasnosel'skaya h.17, Moscow, 107140, Russia.

APH07 The seasonal buoyancy budget of harbour porpoises *(P. phocoena)* during dives

Michail Ragkousis(1), Dr Anders Galatius(2), Dr Danuta Wisniewska(3), Dr Jonas Teilmann(2), Dr Mark Johnson(4), Dr Mette Sif Hansen(5), Prof Peter Schwarz(6), Prof Peter Teglberg Madsen(7), Prof Ursula Siebert(8), As. Prof Morten Tange Olsen(9), Prof Magnus Wahlberg(10)
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Maria Morell(1), Cassandra Girdlestone(2), Stephen Raverty(3), Marina Piscitelli-Doshkov(2), Sonja Ostertag(4), Jason Mulsow(5), Martin Haulena(6), Chad Nordstrom(6), Manfred Kössl(7), Robert Shadwick(2), Jean-Luc Puel(1)
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APH09 Dorsal fin vascular anatomy in the Indian Ocean humpback dolphin *(Sousa plumbea)* and the Indo-Pacific bottlenose dolphin *(Tursiops aduncus)*

Stephanie Plön(1), Dr Andrew Wedderburn-Maxwell(2), Dr Stefan Huggenberger(3), Gui Frainer(4,5)
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APH10 Investigations of the Reproduction Biology of Seals from the North and Baltic Seas

Britta Mueller
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Valentina Concu(1), Dr. Alberto Collareta(2), Prof. Davide Caramella(3), Dr. Daniele Panetta(4), Prof. Giovanni Bianucci(5)
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APH12 How deep can we go. Dolphins of Kalymnos, a non-scientific approach turns into a science project

Eric Maanders, Irma van Velzen
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APH13 Anatomical correlates of honest communication in southern elephant seals

Laura Redaelli(1), Dr. Filippo Galimberti(2), Dr. Simona Sanvito(2)
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BE01 Foraging interactions between south american fur seal and gentoo penguins in the Falkland islands

Iva Kovacic(1), Neda Matosevic(2), Fernando Anido Pedreira(2)
(1) University of Vigo, Spain.
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BE02 Fishing practices cause a concerning alteration on the behavior of three odontocetes species in the Istanbul Strait

Cristóbal Olaya Meza(1), Dr Aylin Akkaya Bas(2), Flavio Affinito(2), Dr Bayram Öztürk(3), Prof Ayaka Amaha Öztürk(3)
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BE04 A high-risk prey for grey seals
Jan Haelters(1), Dr Marjan Doom(2), Francis Kerckhof(3), Dr Alexander Steyaert(4), Dr Thierry Jauniaux(5)
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(5) University of Liège Faculty of Veterinary Medicine Veterinary College Liège, Belgium.

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Raquel García-Vernet(1), Pol Sant(2), Dr Gísli Víkingsson(3), Dr Alex Aguilar(2), Dr Asunción Borrell(2)
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BE06 Harbour Porpoise Responses to the Wind Farm Construction in the Moray Firth, NE Scotland
Saliza Awang Bono, Dr Isla Graham, Prof Paul Thompson
Lighthouse Field Station, University of Aberdeen, George Street, Cromarty, Highlands, IV118YJ, United Kingdom.

BE07 Repeatability and foraging consistency of harbour seals in the Moray Firth, NE Scotland
Lea C. R. Brandes(1), Dr. Isla Graham(2), Dr. Gordon Hastie(3), Prof. Paul Thompson(2)
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BE08 Are harbour porpoises displaced or quiet during construction work of offshore windparks?
Josephine Züchner(1), Dr. Andreas Bick(2), Anja Gallus(3), Dr. Jakob Tougaard(4), Dr. Jacob Nabe-Nielsen(4), Dr. Harald Benke(3), Dr. Michael Dähne(3)
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BE09 The "monastic" menu of the Mediterranean monk seal at Cabo Blanco Peninsula
Gema Hernandez-Milian(1), Mercedes Muñoz-Cañas(2), Moulaye Haya(2), Abba M'bareck(2), Hamdy M'bareck(2), Pablo Fernandez de Larrinoa(2), Luis Mariano González(3), Prof Graham J. Pierce(4)
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BE10 Elucidating The Cave Use Pattern of Mediterranean Monk Seal On Exploited Habitats
Merve Kurt, Meltem Ok, Ali Cemal Gücü
Middle East Technical University, Mersin, 33730, Turkey.

BE11 Characterising the relationship between habitat and prey in harbour porpoise candidate Special Areas of Conservation in the UK
Nikki Taylor, Alice Lowry
University of York, York YO10 5DD United Kingdom

BE12 Individual specialization in Falkland Islands southern elephant seal *(Mirounga leonina)* using stable isotopes of skin and fur
Diego Rita(1), Dr Massimiliano Drago(2), Dr Filippo Galimberti(3), Dr Luis Cardona(4)
(1) University of Barcelona, Av. Diagonal, 643, Barcelona, 08028, Spain.
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BE14 Molecular determination of grey seal diet in the Baltic Sea in relation to the current seal-fishery conflict
Anne-Mette Kroner(1), Morten Tange Olsen(2), Lotte Kindt-Larsen(3), Finn Larsen(3), Karl Lundström(4)
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(2) Section for Evolutionary Genomics, Natural History Museum of Denmark.
(3) Technical University of Denmark, Institute of Aquatic Resources..
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BE15 Influence of interspecific interactions between two sympatric seal species on their habitat use and foraging habitat selection
Mathilde Huon(1), Yann Planque(2), Bernie McConnell(3), Prof Phil Hammond(3), Florence Caurant(2), Cécile Vincent(2)
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BE16 Categorizing different types of aerial leaps of white-beaked dolphins
Charlotte Neumann(1), Magnus Wahlberg(1), Marianne Rasmussen(2)
(1) University of Southern Denmark, Guldsmedevænget 84, Odense S, 5260, Denmark.
(2) University of Iceland's Research Center in Húsavík.

BE17 Whatcha saying? Evidence of production learning in a solitary common dolphin during interspecific interactions with a harbour porpoise
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(1) Wild Earth Foundation, Av de las Ballenas 9500, Puerto Piramides, Argentina.
(2) Clyde Porpoise CIC, Fairlie, UK.
(3) Bioacoustics Group, Centre for Ultrasonic Engineering, Department of Electronic and Electrical Engineering, University of Strathclyde, Glasgow, UK.

BE18 Activity patterns of resident bottlenose dolphins and the emission of bray sequences
Inês Sofia Alves, Ana Rita Luís, Filipa Veiga Sobreira, Prof Manuel Eduardo dos Santos
MARE - Marine and Environmental Sciences Centre, ISPA - Instituto Universitário, Rua das caleiras nº63 6ºC, Maia, 4470-156, Portugal.

BE19 Honest signalling in male and females southern elephant seals (Mirounga leonina)
Giulia Ercoletti(1), Simona Sanvito(2), Filippo Galimberti(2)
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BE20 Franciscana and Guiana dolphins breathing synchrony reflects the proximity to their partner
Guilherme Bortolotto(1), Pamela Actis(2), Dr Daniel Danilewicz(2,3,4), Marta Cremer(5)
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BE21 Long-term diet changes of a coastal predator in parallel to fishery development
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BE22 Bottlenose dolphin (Tursiops truncatus) in the Sicilian Channel (Mediterranean Sea): occurrence, social structure and interaction with fishery
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BE23 Upcycling Fisheries Data: Utilizing active acoustics to estimate cetacean foraging areas in the Black Sea
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Middle East Technical University Institute of Marine Sciences, ODTÜ Deniz Bilimleri Enstitüsü Biyoloji Ofis 111 Erdemli Mersin, 33731, Turkey.

BE24 Incorporation of simulated mid-trophic prey data from SEAPODYM improves the performance of large whales' distribution models
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(6) Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.

BE25 A taste for squid: the prey of Cuvier's beaked whales (Ziphius cavirostris) and Risso's dolphins (Grampus griseus) in the Eastern Mediterranean Sea
Niki Koutouzi(1), MSc Ilias Foskolos(2), MSc Paraskevi Alexiadou(3), Nicholas Badouvas(3), Dr Christina Milani(4), Dr Alexandros Frantzis(3)
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BE26 Does interspecific competition control local density and habitat use of harbour porpoises?
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BE27 A matter of timing: can whale watching data provide essential information on cetaceans niche modelling?
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BE28 Unusual events concerning the Mediterranean monk seal's feeding habits
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(2) Hellenic Coast Guard, Agios Nikolaos, Crete, Greece.
(3) Archipelagos – environment and development, Zakynthou 48, GR-113 62 Athens, Greece.

BE29 Group-size effect in haul-out behavior of Ladoga ringed seal (Pusa hispida ladogensis)

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BE30 Nursing behaviour of mom-calf southern right whales at a breeding ground in South Australia
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(4) Cetacean Research Unit, School of Veterinary and Life Sciences, Murdoch University, Perth, WA, Australia.

BE31 Feeding aggregation of humpback whales in Kresta Bay (Anadyr Gulf, Chukotka) in summer 2017
Lidia Krinova, Olga Titova, Dr. Alexander Burdin
Kamchatka Branch of Pacific Geographical Institute FED RAS, Petropavlovsk-Kamchatsky, Russia .

BE32 Using presence-only modelling to predict five cetacean species' feeding habitat use in Icelandic coastal waters: implications for conservation
Chiara Giulia Bertulli(1), Dr Filipa I.P. Samarra(2), Dr Marianne H. Rasmussen(3), Dr Niall McGinty(4)
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BE33 Behavioural analysis of Delphinus delphis in the eastern Aegean Sea, Greece
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BE34 Bryde's whales in Madeira Archipelago (NE Atlantic): Site fidelity and short-term individual associations
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BE35 Social relationships and death-related behaviour in aquatic mammals: a review
Melissa Amanda Ljubica Reggente(1), Dr Elena Papale(2), Dr Niall McGinty(3), Dr Lavinia Eddy(4), Dr Giuseppe Andrea de Lucia(5), Dr Chiara Giulia Bertulli(1)
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BE36 Social network analysis of killer whales (Orcinus orca) of the Falkland islands
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BE37 The role of kinship in the sociality of herring-eating killer whales (Orcinus orca) in Iceland
Sara B. Tavares(1), Dr Filipa I. P. Samarra(2), Dr Sonia Pascoal(3), Prof Jeff A. Graves(4), Prof Patrick J. O. Miller(5)
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BE38 The relationship between prey availability and consumption by harbour porpoises *(Phocoena phocoena)* in the southern North Sea
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(2) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife, KY16 8LB, UK.

BE39 Shifting foraging habitats of Mediterranean fin whales identified by behavioural data on fine scale and long-time period
Maddalena Jahoda(1), Arianna Azzellino(1,2), Caterina Lanfredi(1), Federica Salandra(1), Sabina Airoldi(1)
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(2) Politecnico di Milano- Environmental Engineering Department.

BE40 Cultural transmission in humpback whales: insights from song hybridisation events during revolutionary song change
Ellen C. Garland(1), Dr Luke Rendell(2), Luca Lamoni(2), Dr M. Michael Poole(3), Dr Michael J. Noad(4)
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(4) Cetacean Ecology and Acoustics Laboratory, School of Veterinary Science, The University of Queensland, Gatton, QLD 4343, Australia.

BE41 Assessing reproductive parameters of females bottlenose dolphin (Tursiops truncatus) from the Aeolian Archipelago (Southern Italy): a thirteen-year mark-recapture study
Monica F. Blasi(1), Chiara Bruno(1,2), Giusy Bonanno Ferraro(1,2)
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BS BYCATCH & STRANDINGS

BS01 Entrapments of cetaceans in stationary pound nets in Black Sea waters of the southern Crimea
Oksana Savenko(1), Elena Gladilina (1), Dr Pavel Gol'din(2), Kseniya Gulak(3)
(1) Ukrainian Scientific Center of Ecology of the Sea , Odesa, Ukraine.
(2) Schmalhausen Institute of Zoology, NASU, Kyiv, Ukraine Ukrainian Scientific Center of Ecology of the Sea, Odesa, Ukraine.
(3) Bogomoletz Institute of Physiology, NASU, Kyiv, Ukraine.

BS02 30 years of activity of the Italian stranding network
Gianni Pavan(1), Dr Michela Podestà(2)
(1) CIBRA - University of Pavia, Via Taramelli 24, Pavia, 27100, Italy.
(2) Natural History Museum of Milan, Italy.

BS03 Take it or leave it: how and why respond to live-stranded beluga neonates
Robert Michaud(1), Janie Giard(2), Albert Michaud(2)
(1) GREMM, 870 avenue Salaberry, Quebec, Quebec, G1R2T9, Canada.
(2) Group for research and education on Marine Mammals.

BS04 Evidences of predation and scavenging by large predatory sharks upon specimens of striped dolphin *(Stenella coeruleoalba)* and short-beaked common dolphin *(Delphinus delphis)* stranded in the coast of Southern Sardinia
Luca Zinzula*, Andrea Orrù, Alberto Russo, Alessandra Sulis, Tiziano Storai, Giovanni Lenti, Daniela Fadda and Giuseppe Ollano*.
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BS05 Stranding records of Cuvier's beaked whale, Ziphius cavirostris on the coast of Turkey and Northern Cyprus, 2016-2017
Ayaka Amaha Öztürk(1), Dr. Arda M. Tonay(2), Dr. Ayhan Dede(2), Dr. Erdem Danyer(3), Dr. Isil Aytemiz Danyer(4), Andrea

Aydinel(5), Prof. Cengiz Deval(6)
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(4) Ministry of Food, Agriculture and Livestock, Ankara, Turkey/Istanbul University, Faculty of Veterinary Medicine/TUDAV.
(5) Taskent Nature Park, Girne.
(6) Akdeniz University, Faculty of Fisheries.

BS06 Investigating the occurrence of marine debris in stranded whales and dolphins in the Netherlands
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(3) Department of Pathobiology, Faculty of Veterinary Medicine (Utrecht University).

BS07 Ship strikes in large whale: an overview of the Italian situation
Michele Povinelli(1), Dr. Giuseppe Palmisano(2), Dr. Letizia Moro(2), Emanuele Zanetti(2), Dr. Cinzia Centelleghe(2), Prof. Bruno Cozzi(2), Dr. Sandro Mazzariol(2)
(1) University of Padua, Viale dell'Università 16, Legnaro, Padova, 35020, Italy.
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CS CITIZEN SCIENCE

CS01 Partnership with public as the important component of the cetacean stranding registration and monitoring network in recreational region
Andrey Artov, Irina Logomonova, Anastasiya Korosteleva, Anastasiya Postnikova
Karadag Biological station

CS02 Whale Track; Crowdsourcing for marine mammal conservation
Lauren Hartny-Mills(1), Alison Lomax(1), Pippa Garrard(1), Joe Woodhouse(2), Dave Kilbey(2)
(1) Hebridean Whale and Dolphin Trust, 28 Main Street, Tobermory, Isle of Mull, PA75 6NU, United Kingdom.
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CS03 1000 eyes: how to multiply eyes for sightings involving stakeholders
Tommaso De Lorenzi(1), Milena Tempesta(1,2), Karin Schlappa(1,2), Francesco Zuppa(1,2)
(1) DelTa-Delfini e Tartarughe in Alto Adriatico, Località Giasbana 8, San Floriano del Collio, Gorizia, 34070, Italy.
(2) University of Trieste.

CS04 It takes a village: Using citizen science to expand monitoring of individual long-finned pilot whales along the coast of Cape Breton Island, Canada
Elizabeth Zwamborn, Dr. Hal Whitehead
Dalhousie University, 1607 Edward St., Halifax, Nova Scotia, B3H 3H9, Canada.

CS05 Introducing England's only resident population of bottlenose dolphins: Using citizen science data to assess the social structure, residency and abundance of the southwest community
Rebecca Dudley(1), Dr Simon Ingram(1), Dr Matt Witt(2)
(1) Plymouth University, Plymouth, PL4 8AA, United Kingdom.
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CS06 Cetaceans of South-Western Crimea: revised polling materials
Evgeny Gol'din
Southern Branch of the National University of Biological Resources and Environmental Management-Crimean Agricultural and Technological University, p/b 2223, Simferopol, Crimea, 95043, Ukraine.

DA DENSITY & ABUNDANCE

DA01 Cuvier's beaked whale photo-identification off North-Eastern Sardinia (Caprera Canyon, central-Western Tyrrhenian Sea): preliminary results on site fidelity and population size

Mattia Leone(1), Elena Fontanesi(1,2), Prof. Renata Manconi(3), PhD Luca Bittau(4)
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(4) SEA ME Sardinia Onlus, via delle Ginestre, 6 (Vill. Piras) - 07024 La Maddalena (Italy).

DA02 Are bottlenose dolphins *(Tursiops truncatus)* increasing in the North–Western part of the Pelagos Sanctuary (Mediterranean Sea)?

Valentina De Santis(1), Prof. Arianna Azzellino(1,2), Dr. Caterina Lanfredi(1), Sabina Airoldi(1)
(1) Tethys Research Institute, Milano, 20090, Italy.
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DA03 Abundance assessment of sperm whales (Physeter macrocephalus) in the North-Western portion of the Pelagos Sanctuary (NW Mediterranean Sea)

Caterina Lanfredi(1), Prof. Arianna Azzellino(1,2), Dr. Aurelie Moulins(3), Dr. Massimiliano Rosso(3), Dr. Paola Tepsich(3), Sabina Airoldi(1)
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(3) Fondazione CIMA, Interuniversity Research Center for Environmental Monitoring, Via Magliotto, 2, 17100 Savona, Italy.

DA04 First line transect based abundance estimate of spotted dolphin in Canary Islands in the framework of MISTIC SEAS 2 project

Mónica Pérez Gil(1), Antonella Servidio(1), Enrique Pérez Gil(1), Nuria Varo Cruz(2), Jose Antonio Vázquez (3), Ana Cañadas (3)
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(2) Asociación para el Desarrollo Sostenible y la Conservación de la Biodiversidad (ADS-BIODIVERSIDAD).
(3) Alnilam Research and Conservation.

DA06 A preliminary photo-identification study of the individual bottlenose dolphins using the Northumberland coastline in northeast England

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(1) Cetacean Research & Rescue Unit (CRRU), PO Box 11307, Banff, Aberdeenshire, AB45 3WB, United Kingdom.
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DA07 Abundance of Commerson's and Peale's dolphins in inshore waters of the Falklands Islands estimated by aerial survey

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DA08 Occurrence of fin whale *(Balaenoptera physalus)* in the Azores archipelago: assessment on its migration behavior and first photo-ID catalogue of the area

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DA09 ObSERVE-ACOUSTIC: Sperm Whale Density and Abundance in Western Irish Waters

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DA10 Decline in fin whale survival in the Gulf of St Lawrence: the effect of terminal bias and capture heterogeneity?

Anna Schleimer(1), Dr Julien Delarue(2), Dr Christian Ramp(3), Dr Martine Bérubé(4), Dr RIchard Sears(3), Prof Per J. Palsbøll(4), Prof Philip S. Hammond(5)
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(5) Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, UK.

DA11 Acoustic, genetic and observational evidence indicate the presence of humpback whales (Megaptera novaeangliae) from both hemispheres in Cape Verdean waters during their respective breeding seasons

Conor Ryan(1), Dr Simon Berrow(2), Miriam Romagosa(3), Dr Oliver Boisseau(4), Pedro Lopez-Suarez(5), Beatrice Jann(6), Frederick Wenzel(7), Dr Martine Berubé(8), Prof Per Palsbøll(8)
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(5) Bios CV, Sal Rei, Boa Vista, Cape Verde.
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(8) Faculty of Science and Engineering, GELIFES — Groningen Institute for Evolutionary Life Sciences, Nijenborgh 7, 9747 AG Groningen, The Netherlands.

DA12 An updated abundance estimate for the endangered population of bottlenose dolphins (Tursiops truncatus) in Bahía San Antonio, Northern Patagonia, Argentina

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DA13 First photo-identification study of false killer whales (Pseudorca crassidens) in the Azores Archipelago

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DA14 Temporal variation of small cetacean presence along French coasts revealed by statis acoustic monitoring

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DA15 Abundance estimate of an inshore population of bottlenose dolphins in Ireland using mark-recapture and citizen science

Carlota Vialcho Miranda(1), Isabel Baker(1), Katharina Reusch(2), Pádraig Whooley(3), Dr Joanne O'Brien(3), Dr Simon Berrow(3)
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DA16 Presence of short-beaked common dolphin (Delphinus delphis) in the shallow waters of the south coast of Samos, eastern Aegean Sea

Sara Ferreiro Carballal(1), Guido Pietroluongo (2), Thodoris Tsimpidis (2)

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(2) Archipelagos Institute of Marine Conservation, Samos, Greece.

DA17 Baleen whale community off the west of Ireland as determined through Static Acoustic Monitoring (SAM)
Joanne O'Brien(1), Dr Simon Berrow(1), Rossa Meade(1), Dr Julien Delarue(2), Katie Kowarski(2), Bruce Martin(2), John Moloney(2), Dr Oliver Ó Cadhla(3)
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(3) National Parks and Wildlife Service.

DA18 Mr. Liable: A resident male sperm whale in the Azores?
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(4) cE3c - Centre for Ecology, Evolution and Environmental Changes/Azorean Biodiversity Group, and Faculdade de Ciências e Tecnologia, Universidade dos Açores. Ponta Delgada, Azores, Portugal.

DA19 Demographical analysis of the endangered population of the harbour porpoise from the Sea of Azov using a Bayesian-based model
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DA20 Preliminary mark-recapture analysis of sperm whale (Physeter macrocephalus) photo-ID data from the Aeolian Archipelago (Italy)
Agata Irene Di Paola(1), Giusy Bonanno Ferraro(2,3), Chiara Bruno(2,3), Monica Francesca Blasi(2)
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ED EVOLUTION & DEVELOPMENT

ED01 A Finless Common Bottlenose Dolphin Successfully Coping with Its Twist of Fate
Joan Gonzalvo, Stefano Agazzi
Tethys Research Institute, Viale G.B. Gadio 2, Milano, Milano, 20121, Italy.

ED02 Energy saving strategy of the cetacean survival or special history of co-evolution of the immune system of Cetacea and their pathogenic microflora
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(1) National Hematology Research Centre (NHRC), Noviy zykovskiy proezd, 4,, Moscow, 125167, Russia.
(2) K.I. Skryabin Moscow State Academy of Veterinary Medicine and Biotechnology, Department of Microbiology, Moscow, Russia .

ED03 Maturation of auditory cortex in bottlenose dolphin *(Tursiops truncatus)*
Cinzia Centelleghe(1), Dr. Antonella Peruffo(2), Dr. Livio Corain(3), Dr. Jean-Marie Graic(2), Dr- Michela Podestà(4), Dr. Sandro Mazzariol(2), Prof. Bruno Cozzi(2)
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ED04 Evolutionary history of the porpoises *(Phocoenidae)*

Yacine Ben Chehida(1), Prof Alex Aguilar(2), Prof Asunción Borrel(2), Dr. Marisa Ferreira(3), Dr. Barbara L. Taylor(4), Dr. Lorenzo Rojas-Bracho(5), Dr. Kelly Roberston(6), MSc Julie Thumloup(1), MSc Cassie Schumacher(7), Dr. Gísli A. Vikingsson(8), Dr. Phill A. Morin(6), Dr. Michael C. Fontaine(1)
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(7) Swift Biosciences, 58 Parkland Plaza, Suite 100, Ann Arbor, MI 48103, USA.
(8) Marine Research Institute, PO Box 1390, 121 Reykjavik, Iceland.

ED05 Study of the juvenile stage of fin whales (Balaenoptera physalus) through the analysis of lipid content and stable isotopes in earplugs

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GE GENETICS

GE01 Further insights into the genetic differentiation of North Atlantic killer whale populations with particular reference to the West Coast Community

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GE02 Population structure of sei whales (Balaenoptera borealis) inferred from mitochondrial control region DNA sequences and microsatellite genotypes

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(8) The Institute of Cetacean Research, 4-5, Toyomi-cho, Chuo-ku, Tokyo, 104-0055, Japan.

GE03 Genome-wide SNPs improve population resolution for the Baltic harbour porpoise (Phocoena phocoena)

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(6) Swedish Museum of Natural History, SE-104 05 Stockholm, Sweden.

(7) Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover, Foundation; Werftstr. 6, 25761 Büsum, Germany.

GE05 Metagenomic study of Caspian seals *(Pusa caspica)* microbiome of respiratory, urogenital and alimentary tracts

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GE06 Genetic structure of bycaught harbour porpoise, Phocoena phocoena in Norwegian waters assessed with microsatellite markers

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(1) Institute of Marine Research - Bergen, Postboks 1870 Nordnes, Bergen, Hordaland, 5817, Norway.
(2) Institute of Marine Research, Tromsø - Norway.

GE07 Linkage disequilibrium in population genetics .How to assess population size and improve conservation management for endangered species

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HD HABITAT & DISTRIBUTION

HD02 The distribution and vocal behavior of the Atlantic white-sided dolphins (Lagenorhynchus acutus) in northern Norway

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HD03 Fin whale (Balaenoptera physalus) acoustic presence off Elephant Island, Antarctica

Elke Burkhardt (1), Dr Olaf Boebel (1), Boris Cisewski (2), Ramona Mattmueller (1), Marlene Meister (1), Elena Schall (1), Stefanie Spiesecke (1), Dr Karolin Thomisch (1), Dr Ilse C. Van Opzeeland (1)
(1)Alfred-Wegener-Institut Helmholtz-Zentrum für Polar und Meeresforschung, Am Alten Hafen 26, Bremerhaven, 27568, Germany.
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HD04 Estimating the distribution of the common bottlenose dolphin (Tursiops truncatus) in the Ría de Arousa, NW Spain

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HD06 Encounters with an anomalously white harbour porpoise (Phocoena phocoena) – first record of porpoises in the mouth of Douro River (Porto, Portugal)

Ágatha Gil(1), Ana M. Correia(1,2), Mieke Weyn(1), Professor Isabel Sousa-Pinto(1,2)
(1) Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), 4050-123 Porto, Portugal
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HD07 Common Bottlenose Dolphin (Tursiops truncatus) population in the Marine Protected Area of the Cap de Creus Canyon, Northwestern Mediterranean

Carla A. Chicote, Prof Manel Gazo, Irene Álvarez de Quevedo, Alicia Cardona
SUBMON - Conservation, study and awareness of the marine environment; Rabassa, 49; 08024Barcelona, Spain. www.submon.org .

HD08 First record after thirty years of rough-toothed dolphin (Steno bredanensis) offshore Eastern Sicily
Francesco Caruso(1), Dr Virginia Sciacca(1), Ignazio Parisi(2), Giovanni de Vincenzi(3), Dr Alessandro Bocconcelli(4), Dr Aran Mooney(5), Dr Laela Sayigh(5), Prof Songhai Li(6), Dr Aurelie Moulins(7), Dr Paola Tepsich(7), Dr Massimiliano Rosso(7)
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(5) Woods Hole Oceanographic Institution, Department of Biology, Woods Hole, USA.
(6) Institute of Deep-sea Science and Engineering - Chinese Academy of Sciences, Marine Mammal and Marine Bioacoustics Lab, Sanya, China.
(7) CIMA Research Foundation, Savona, Italy.

HD09 Tracking striped dolphins movement in the Alkionides Gulf (Gulf of Corinth, Greece)
Marta Azzolin(1), Dr. Andrea Giovannini(1,2), Serena Guichardaz(1,2), Laura Pintore(2), Arianna Zampollo(2), Prof. Cristina Giacoma(1)
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(2) Gaia Research Institute Onlus, Corso Moncalieri 68B, 10133 Torino, Italy.

HD10 Dakhla Bay (Morocco) 20 years on, a preliminary study on cetacean diversity and distribution in the area
Francisco Félix Zarzuela, Samantha Blakeman, Beatrice Parodi, Marta Castillo Ramírez, Álvaro Carrasco González, Renaud De Stephanis, Juan Manuel Salazar Sierra
CIRCE, Tomás Ostariz Forcén 34, Zaragoza, Zaragoza, 50016, Spain.

HD11 Results of cetaceans monitoring in the three-year period 2013-2015 along the Livorno-Bastia sample transect in correlation with fixed environmental parameters
Veronica Mazzucato(1,2), Prof. Alberto Castelli(1), Martina Gregorietti(2), Cristina Luperini(1,2), Phd Antonella Arcangeli(3)
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(2) Accademia del Leviatano, via Paolieri 7, Albinia, Grosseto, 58015, Italy.
(3) ISPRA BIO Dep. - Environmental conservation and monitoring.

HD12 Long term evolution (1992-2015) in the distribution and the reproduction of three species of cetaceans in the north-western Mediterranean Sea
Léa David (1), Dr Nathalie Di-Méglio(1), Marine Roul(1), Denis Ody(2), Théa Jacob(2)
(1) EcoOcéan Institute, France.
(2) WWF-France.

HD13 Habitat modelling of offshore Irish waters based on visual data collected during the Cetaceans on the Frontier Surveys (2009-2014)
Cynthia Barile(1), Dr Simon Berrow(2), Dr Dave Wall(3), Dr Conor Ryan(4), Dr Joanne O'Brien(2)
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HD14 Cetacean distribution off the central Catalan coast, NW Mediterranean Sea
Maria Serrano, Montse Valls, Ricard Marcos
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HD16 First video documented presence of Mediterranean monk seal in Southern Apulia (Italy)
Luigi Bundone(1), Sergio Fai(2), Prof Emanuela Molinaroli(3)
(1) Archipelagos-ambiente e sviluppo, Italia, Calle Asiago, 4, Venezia, Venezia, 30132, Italy.
(2) M.P.A. Porto Cesareo. Porto Cesareo (LE), Italy.
(3) Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice. Venezia, Italy.

HD17 Large-scale movements of bottlenose dolphins (Tursiops truncatus) within the Macaronesia (NE Atlantic): dolphins with an international playground
Carlota Molina(1), Marta Tobeña(2), Karin Hartman(3), Marc Fernandez(4), Vidal Martín(5), Natacha Aguilar de Soto(6), Filipe Alves(7), Ana Dinis(7)
(1) Barcelona, Spain.
(1) IMAR-Centre of the Institute of Marine Research of the University of Azores, Horta, Portugal .
(3) Nova Atlantis Foundation, Risso's Dolphin Research Center, Azores, Portugal .
(4) cE3c - Centre for Ecology, Evolution and Environmental Changes /Azorean Biodiversity Group and University of Azores, Portugal .
(5) SECAC Society for the Study of Cetaceans in the Canary Archipelago, Arrecife, Lanzarote, Spain .
(6) BIOECOMAC, Department of Animal Biology, University of La Laguna, Tenerife, Spain Sea Mammal Research Unit (SMRU), University of St. Andrews, St. Andrews, UK .
(7) CIIMAR/CIIMAR-Madeira, Interdisciplinary Centre of Marine and Environmental Research of Madeira, Portugal Oceanic Observatory of Madeira, Madeira, Portugal .

HD18 Gradient in "hotness": Using and evaluating emerging hot spot analysis to test long-term changes in dolphin distribution off Kaikoura, New Zealand
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(1) National Marine Fisheries Service, NOAA, 4444 Connecticut Av NW, Washington, District Of Columbia, 20008, United States.
(2) National Marine Fisheries Service (NMFS) Office of Science and Technology.

HD19 Winter distribution of cetacean in Bulgarian Black Sea
Dimitar Popov
Green Balkans NGO, 1 Skopie str., Plovdiv, Plovdiv, 4004, Bulgaria.

HD20 Distribution and abundance of bottlenose dolphins *(Tursiops truncatus)* on the south coast of Portugal
Sara Vieira(1), Joana Castro(2), André Cid(2), Prof Rui Rosa(3)
(1) Lisbon, Portugal.
(2) AIMM - Marine Environment Research Association.
(3) Rui Rosa Lab.

HD21 Bottlenose dolphin ecotypes in the western South Atlantic: exploring the puzzle of dorsal fin shapes, colors and habitats
Paulo Simões-Lopes(1), Prof Fábio Daura-Jorge(2), Dra Liliane Lodi(3), Carolina Bezamat(2), Ana Costa(4), Dr. Leonardo Wedekin(5)
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(3) Projeto Baleias & Golfinhos do Rio de Janeiro, Instituto Mar Adentro, Rio de Janeiro, RJ. Brazil.
(4) Department of Biology, University of Louisiana at Lafayette, Lafayette, Louisiana, U.S.A.
(5) Socioambiental Consultores Associados, Florianópolis, SC, Brazil.

HD22 Modelling the distribution of Delphinus delphis in the eastern Aegean Sea: identifying the key variables in their habitat
Maria Andreina Esteves Perez(1), Guido Pietroluongo(1), Anastasia Miliou (2), Prof Di Bonito Marcello(3), Prof Nicholas Ray(3)
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HD23 Complex temporal distribution of fin whales and sei whales in the Azores
Víctor Ojeda(1), Cristina Montoya(1), Miranda van der Linde(1), Laura González(2,1)
(1) Futurismo Azores Adventures, Rua do Peru 103, 9500-340 Ponta Delgada, Azores, Portugal
(2) Department of Applied Physics, Vigo University, Vigo, Spain.

HD24 Spring and summer cetacean abundance and distribution for romanian territorial waters using line transect sampling method
Paiu Romulus-Marian, Paiu Angelica, Cândea-Mirea Mihaela, Gheorghe Anca-Maria
Mare Nostrum NGO, Bogdan Voda no 16, Constanta, 900613, Romania.

HD25 Influence of environmental factors on the spatial distribution of two cetacean species: Common bottlenose and short-beaked common dolphins in the eastern Aegean Sea
Célia Fery(1), Dr Guido Pietroluongo (2), Thodoris Tsimpidis(2)
(1) Université de Montpellier.
(2) Archipelagos Institute of Marine Conservation, Samos, Greece.

HD26 Modelling the distribution of odontocetes in the four island region of Maui, Hawaii using platform of opportunity data
Holly Self(1), Prof David Lusseau(1), Stephanie Stack(2)
(1)University of Aberdeen.
(2) Pacific Whale Foundation.

HD27 Spatial and temporal distribution of the short-beaked common dolphin (Delphinus delphis) in NW Spain
Oriol Giralt Paradell, Séverine Methion, Bruno Díaz López
Bottlenose Dolphin Research Institute BDRI, Av Beiramar 192, O Grove, Pontevedra, 36980, Spain.

HD28 Impact of gillnets and seine fisheries on bottlenose dolphin's distribution in the Ría of Arousa, NW Spain
Emma Persyn, Séverine Methion, Bruno Díaz López
Bottlenose Dolphin Research Institute BDRI, Av. Beiramar 192, O Grove, Pontevedra, 36980, Spain.

HD29 Inter-annual variability of the distribution of fin whale (Baleanoptera physalus) and sperm whale (Physeter macrocephalus) in the Western Mediterranean Sea: 12 years of data
Davide Ascheri(1), Prof. Alberta Mandich(2), Barbara Nani(3,4), Jessica Alessi(2,5)
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(2) Department of Earth, Environment & Life Sciences, University of Genoa, Italy, (3) CIRCE, Centro Interuniversitario di Ricerca sui Cetacei, c/o DISTAV, University of Genoa, Italy..
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(5) Associazione Me.Ri.S. Mediterraneo Ricerca e Sviluppo, Favara (AG), Italy.

HM HEALT & MEDICINE

HM01 Investigating the persistent organic pollutants in cetaceans. Preliminary data on dioxin burden in the blubber of bottlenose dolphins *(Tursiops truncatus)* stranded along Adriatic Sea coastline
Pietro Badagliacca, Dr Roberta Ceci, Dr Maria Serena Tulini, Dr Antonio Cocco, Dr Ludovica Di Renzo, Dr Nicola Ferri, Dr Gianfranco Diletti
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HM02 Development of technique for post-mortem external cerebrospinal fluid (CSF) collection in cetaceans
Misty Niemeyer(1), Robert Cooper(1), Nicole Hunter(1), Dr. Sarah Sharp(1), Kristen Patchett(1), Kathryn Rose(1), Kira Kasper(1), Jane Hoppe(1), Dr. Michael Moore(1,2), Kristen Volker(1), Brian Sharp(1)
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(2) Woods Hole Oceanographic Institution (WHOI).

HM03 Improving detection of cetacean morbillivirus in South Atlantic cetaceans
Kátia Groch(1), Dr. Eva Sierra(2), Dr. Josué Díaz-Delgado(3), Dr. Antonio Fernández(4), Dr. José Luiz Catão-Dias(5)
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(5) Laboratório de Patologia Comparada de Animais Selvagens, Faculdade de Medicina Veterinária e Zootecnia, Universidade de São Paulo, São Paulo, SP, Brazil..

HM04 Beta amyloid peptide and phosphorylated tau protein expression in the frontal cortex and cerebellum of the toothed whales: preliminary observations and future directions

Simona Sacchini(1), Prof Antonio Espinosa de los Monteros(2), Dr Yania Paz(2), Prof Pedro Herraéz(2), Tania Ramírez(2), Prof Manuel Arbelo(2), Prof Antonio Fernández(2)
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HM05 First Assessment of organochlorine levels in three different cetacean species in the Greek Ionian Sea

Guia Consales(1), Joan Gonzalvo(2), Tilen Genov(3), Filippo Orlandi(1), Carlo Amico(1), Letizia Marsili(4)
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HM06 How do organic pollutants affect seals' health? A review

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(3) Department of Zoology, Federal University of Rio Grande do Sul. Avenida Bento Gonçalves 9500, CEP 91540-000, Porto Alegre, Rio Grande do Sul, Brazil. .

HM07 An overview of current issues in seal rescue and rehabilitation in the U.K.

Dan Jarvis, Stephen Marsh
British Divers Marine Life Rescue, 30 Pentowan Gardens, Hayle, Cornwall, TR27 5AZ, United Kingdom.

HM08 Twelve fatal weeks – elevated grey seal (Halichoerus grypus) casualties in the German Baltic Sea in autumn 2017

Linda Westphal(1), Vivica von Vietinghoff(2), Prof. Dr. Henning von Nordheim (3), Falko Bindernagel(4), Dr. Michael Dähne(2)
(1) 18057, Germany.
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(3) German Federal Agency for Nature Conservation .
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HM09 Pup mortality of the Mediterranean monk seal (Monachus monachus) at Cabo Blanco peninsula

Mercedes Muñoz-Cañas(1), Moulaye Haya(1), Abba M'Bareck(1), Hamady M'Bareck(1), Miguel Ángel Cedenilla(1), Fernando Aparicio(1), Luis Mariano González(2), Pablo Fernández de Larrinoa(1)
(1) Fundacion CBD-Habitat, C/Gustavo Fernandez Balbuena 2 entreplanta 1A, Madrid, Madrid, 28002, Spain.
(2) Ministry of Agriculture and Fisheries, Food and Environment (MAPAMA) Subdirección General de Medio Natural Plaza de San Juan de la Cruz, s/n 28071 Madrid, Spain.

HM10 Uncinaria sp. (Nematoda: Ancylostomatidae) Infestation in Mediterranean monk seal from Eastern Mediterranean coast of Turkey

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HM11 Crassicauda sp. infestation in Cuvier's beaked whale, Ziphius cavirostris from Eastern Mediterranean coast of Turkey

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(4) Turkey Ministry of Food, Agriculture and Livestock, Ankara,
(5) Turkey Istanbul University, Faculty of Veterinary Medicine, Department of Pathology, Istanbul, Turkey.

HM12 Genital hypoplasia in a striped dolphin (Stenella coeruleoalba) stranded in Northern France

Thierry Jauniaux(1), Willy Dabin(2), Mathieu Franssen (1), Tiphaine Gregoire(1), Jacky Karpouzopoulos (4), Michaël Scarlet(1), Mutien-Marie Garigliany(1)
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HM13 Seasonal variations in girth measurements of individual harbour porpoises *(Phocoena phocoena)*

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HM14 The snowball effect of loosing body mass: diving and health implications

Yara Bernaldo de Quirós(1), Michael Moore(2), Marina Arregui(3), Misty Niemeyer(4), Marisa Tejedor(5), Eva Sierra(6), Manuel Arbelo(6), Andreas Fahlman(7), Miguel Rivero(6), Antonio Fernández(6)
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(5) Canary Islands Cetacean Stranding Network.
(6) Atlantic Cetacean Research Center, Institute of Animal Health, University of Las Palmas de Gran Canaria.
(7) Foundation Oceanografic.

HM15 Haematology and Serum Biochemistry of Harbour Seal (Phoca vitulina) Pups after Rehabilitation in the Netherlands

Anna Salazar Casals(1), Ana Rubio-Garcia(1), Alberto Arriba-Garcia(1), John O'Connor(1), Antonio Mignucci-Giannoni(2)
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(2) Puerto Rico Manatee Conservation Center.

HM16 Severe jaw injury in a common bottlenose dolphin (Tursiops truncatus) from the Gulf of Trieste, northern Adriatic Sea

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(3) Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, United Kingdom.

HM17 Immunohistochemical investigation of the cross-reactivity of selected cell markers in formalin-fixed, paraffin-embedded lymphoid tissues of Franciscana *(Pontoporia blainvillei)*

Josué Díaz-Delgado(1), Rodrigo Ressio(2), Dr. Kátia Groch(1), Prof. José-Luiz Catão-Dias(1)
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HM18 Pyogranulomatous encephalitis associated with cerebral trematodiasis in a Blainville´s beaked whale *(Mesoplodon densirostris)*

Manuel Arbelo(1), Raquel Puig(2), Eva Sierra(2), Yara Bernaldo de Quirós(2), Nakita Cámara(2), Tania Ramírez(2), Simona Sacchini(2), Jesús De la Fuente(2), Cristian Suárez-Santana(2), Prof Antonio Fernández(2)
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HM19 Gross and histopathological characterization of cardiac lesions associated with stress by active stranding in a bryde's whale *(Balaenoptera edeni)*

Nakita Camara, Dr Eva Sierra, Dr Cristian Suárez-Santana, Raquel Puig(4), Dr Jesús De la Fuente, Dr Manuel Arbelo, Prof Antonio Fernández, Prof Pedro Herráez
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HM20 Histological and immunohistochemical findings in cetaceans stranded along Sicily coast (2013-2017)

Roberto Puleio, Dr. Domenico Vicari, Dr. Anna Tamburello, Dr. Gisella Purpari, Dr. Francesco Mira, Dr. Annalisa Guercio, Dr. Guido Ruggero Loria, Dr. Santo Caracappa
Istituto Zooprofilattico della Sicilia, via Gino Marinuzzi 3, Palermo, 90129, Italy.

HM21 Morbillivirus in Risso's dolphins (Grampus griseus): a phylogenetic and pathological study in the Canary Islands

Eva Sierra(1), Prof Antonio Fernández(2), Dr Daniele Zucca(2), Nakita Câmara(2), Idaira Felipe-Jiménez(2), Dr Cristian Suárez-Santana(2), Dr Yara Bernaldo de Quirós(2), Dr Manuel Arbelo(2)
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HM22 Asphyxiation-related death in cetaceans stranded along the Adriatic coast of Italy

Ludovica Di Renzo(1), Dr Nicola Ferri(2), Dr Vincenzo Olivieri(3,4), Dr William Di Nardo(3,5), Dr Cristina Esmeralda Di Francesco(6), Dr Giovanni Di Guardo(6), Dr Gabriella Di Francesco(7)
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HM23 Establishment of the first Dolphin Rescue Center in Russia as a platform for strategic partnership and interaction of scientists, ecologists, animal advocates and government entities

Tatiana Beley(1), Dr Tatyana Denisenko(2), Oksana Fedorova(2), Lusine Balabadzhian(2)
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HM25 The comparative characteristic of a microbiota of an organism of the free living and captured marine mammals

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(4) Research-expedition Centre for study of marine mammals, Moscow, Russia.

HM26 Low prevalence of Cryptosporidium sp. and Giardia sp. in marine mammals present in German waters
Miguel Grilo(1), Sara Valente(2), Sandra Rebelo(2), Lídia Gomes(2), Prof. Luís Madeira de Carvalho(2), Prof. Joana Robalo(3), Prof. Manuela Oliveira(2), Prof. Ursula Siebert(4), Doctor Kristina Lehnert(4)
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HM27 Gram-negative microbiota isolated from walruses as an indicator of anthropogenic pollution of the Arctic
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HM28 Possible role of coccus microbiota in pathologies of Atlantic Walrus (Odobenus rosmarus)
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(2) K.I.Skryabin Moscow State Academy of Veterinary Medicine & Biotechnology.
(3) Marine Mammal Council.
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HM29 An in silico study of dolphin Morbillivirus haemagglutinin complexed to sperm whale *(Physeter macrocephalus)* SLAM and nectin-4 receptors
Giovanni Di Guardo (1), Dr Luca Zinzula(2,3), Dr Gabriella Di Francesco (4), Dr Cinzia Centelleghe(5), Dr Sandro Mazzariol(6), Dr Massimiliano Orsini (3)
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HM30 Baleen plates of mysticetes adsorb strontium during their growth
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MC MANAGEMENT & CONSERVATION

MC01 From local to regional: acoustic monitoring targeting MSFD's and Cetacean's Good Environmental Sound Status
Joseph Vella(1), Dr Adriana Vella(2), Dr Ramón Miralles(3), Dr Guillermo Lara(3), Dr Rosa Martínez Álvarez Castellanos(4), Dr Pablo Ruiz(4), Dr Pablo Cervantes(4)
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(4) Res. Área de Nievas Tecnologías, Centro Tecnológico Naval y del Mar.

MC02 Whale-watching in Russia: from idea to implementation. Experience of creating and conducting tourist scientific expeditions for the observation of marine mammals in the Black sea
Aleksandra Golubtsova(1), Aleksandr Agafonov(2)

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MC03 First assessment of pinger use with fishing gear in Maltese waters: addressing dolphins-fishermen conflicts
Adriana Vella
Conservation Biology Research Group, University of Malta,, Taq-Qroqq, Msida, MSD2080, Malta.

MC04 Social aspects and prerequisites for the development of whalewatching in Russia
Aleksandra Golubtsova
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MC05 Assessing short- and long-term individual exposure rate of two cetacean species to whale-watching activity in Madeira Island (NE Atlantic)
Annalisa Sambolino(1), Filipe Alves(1,2), Rita Ferreira(2), Ana Dinis(1,2)
(1) CIIMAR-Madeira, Edifício Madeira Tecnopolo (Piso 0), Caminho da Penteada, Funchal, 9020 – 105, Portugal.
(2) Oceanic Observatory of Madeira, Funchal, Portugal.

MC06 Collaboration between academia, industry and regulators to investigate cetacean collision risk from tidal turbines
Gemma Veneruso(1,2), Jenny Bond(1), Dr Line Cordes(2), Dr Alice Goward-Brown(1), Dr Gordon Hastie(3), Prof Lewis LeVay(1), Ceri Morris(4), Marco Piano(1), Dr Michael Roberts(1), James Slingsby(2), Kate Smith(4), Dr Tom Stringell(4), Dr James Waggitt(2)
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(3) Sea Mammal Research Unit, University of St Andrews.
(4) Natural Resources Wales.

MC07 Marine pollution caused by Floating Marine Macro Litter and comparison with presence, spatial distribution and density of cetaceans, in the Pelagos Sanctuary
Cristina Luperini(1), Prof. Simone Gorelli(2), Prof. Alberto Castelli(1), Dr. Roberto Crosti(3), Dr. Antonella Arcangeli(3)
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(3) ISPRA, Dipartimento Difesa della Natura.

MC08 Operation Milagro: Last chance for the Vaquita
Elena Santolini, Tommaso De Lorenzi.

MC09 A combined social-ecological approach for the assessment of the Samadai Reef management plan
Maddalena Fumagalli(1), Dr Amina Cesario(1), Dr Marina Costa(1,2), Prof Elisabeth Slooten(3), Prof James Higham(4), Dr Giuseppe Notarbartolo di Sciara(1)
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(3) University of Otago, Zoology Dept. 340 Great King Street, Dunedin 9054, New Zealand .
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MC10 Towards the first sustainable whale watching enterprise in Malta: the challenge of merging public awareness with research
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(3) Orca, Triq id-Dwiemes, Zejtun, Malta .
(4) AquaBioTech Group, Central Complex, Naggar Street Targa Gap, Mosta, Malta .

MC11 Space and perspectives: are the Ringed seals in the Gulf of Finland approaching the vanishing point?
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(2) Pro Mare NGO.
(3) St.Petersburg Research Centre.

MC12 Marine renewable energy as a positive force in marine mammal conservation: Strategic partnerships provide impetus for improved marine mammal science and conservation
Hanna Nuuttila, Chiara Bertelli, Anouska Mendzil
Swansea University

MC13 MARCET Project: International and Multidisciplinary Network for the conservation of cetaceans and the promotion of a sustainable tourism associated with whale watching activity in the Macaronesian waters
Jesús De la Fuente(1), Manuel Arbelo(1), María Dolores Gelado(2), Tania Montoto(2), Blas J. Galván(3), Chaitanya Suárez(4), Yen E. Lam(4), Carmelo León(4), Ayoze Castro(5), Eric Delory(5), Silvana Neves(5), Octavio Llinás(5), Fernando Rosa(6), Elvira Balguerías(7), Mónica Quesada(7), José Luis Guersi(7), Javier Almunia(8), Carmen García(9), Marco Santos(10), Helena Cepêda(10), Gilberto Carreira(10), Ana Dinis(11), Rita Ferreira(11), Filipe Alves(11), Nuno Marques(12), Luis Freitas(12), Kátia Santos(13), Nilson Brás(13), Carolina Oujo(14), Pedro López(14), Yaghouba Kane(15), Yalacé Yamba Kaboret(15), Jean Auguste Barthélémy Batieno(16), Ahmed Senhoury(16), Antonio Fernández(1)
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(14) BIOS.CV (Cabo Verde Islands).
(15) Interstate School of Veterinary Science and Medicine (Senegal).
(16) Regional Marine and Coastal Conservation Programme for West Africa (Senegal).

MC14 Cetacean Conservation: Science and policy working in partnership
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MC16 Investigating potential causes of population change in a coastal bottlenose dolphin community
Peter Evans, Katrin Lohrengel
Sea Watch Foundation, Ewyn y Don, Bull Bay, Amlwch, Gwynedd, LL68 9SD, United Kingdom.

MC17 Mapping current and future risks to the globally significant marine habitat of Chilean Patagonia
Rafaela Landea(1), James Watson(2,3), Kendall Jones(2,4), Maria José Martinez Harms(4), Hedley Grantham(3), Luis Outeiro(5)
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MC18 Cetacean acoustic diversity in the south atlantic ocean: complimentarity of techniques applied for marine conservation
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MC19 Marine activities causing harassment to common, striped, bottlenose dolphins in the waters between Gibraltar and Algeciras

Rocío Espada Ruíz (1), Estefanía Martín Moreno (2), Luisa Haasová(2), Liliana Olaya Ponzone(3), Alessia Scuderi (4), Prof José Carlos García-Gómez (3)
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MC20 Observing Cetaceans From Land – Developing Co-operation as the Driving Force Behind Sustainable Whale Watching Tourism

Fabian Ritter, Christian Steindorff, Christina Sommer, Volker Smit
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MC21 Co-occurrence of Bottlenose dolphin and human activities along the Mediterranean French continental coasts

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MC24 Study of the interaction events between bottlenose dolphins and the midwater pair trawlers: assessment of the effectiveness of pinger by using the passive acoustic monitoring and photo-identifications technique

Valentina Corrias(1), Dott.ssa Sara Bonanomi(2), Dott.ssa Joana Buoninsegni(3), Dott. Alessandro Colombelli(2), Dott. Giovanni de Vincenzi(4), Dott. Francesco Filiciotto(4), Dott. Fabrizio Moro(2), Dott. Emilio Notti(2), Dott. Jacopo Pulcinella(2), Dott.ssa Virginia Sciacca(4), Dott. Antonello Sala(2)
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MC25 Revisiting Natura 2000 network from a Systematic Conservation Planning perspective: the endangered Mediterranean common dolphin subpopulation as a case study

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MC26 Striped dolphin coastal population and boat traffic off Antibes: a conservation challenge

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MC27 Can human activities influence foraging habitat selection in wild bottlenose dolphins?
Séverine Methion, Bruno Díaz López
Bottlenose Dolphin Research Institute BDRI, Av. Beiramar 192, O Grove, Pontevedra, 36980, Spain.

MC28 The alarming case of the dolphin-fisheries interaction in Thermaic Gulf, Greece
Ioannis Giovos(1), Dr. Aimilia Drougas(2), Dr. Anastasia Komnenou(2,3), Dr. Joan Gonzalvo(4)
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(4) Tethys Research Institute.

MC29 Creating a whale sanctuary in the Western Indian Ocean: between local normative instruments and international cooperation for a network governance (case study with the "whale route")
Stephanie Sorby
University of La Réunion 15 Avenue René Cassin, Sainte-Clotilde 97715, Réunion

MC30 The Development of a Network of Local Land-based Surveyors on the Isle of Man
Jennifer Adams, Thomas Felce
Manx Whale and Dolphin Watch, Tynwald Road, Peel, IM51JZ, Isle of Man.

MC31 How to exploit the environmental value of the Posidonia prairies
Marco Gonella
Independent researcher, Cavour 59, Calliano (AT), 14031, Italy.

MC32 Interaction of common, striped and bottlenose dolphins with marine debris in the waters between Algeciras and Gibraltar
Luisa Haasová(1), Rocio Espada Ruíz (1,2,3), Estefanía Martín Moreno(1,2,3), Alessia Scuderi(1, 4), Liliana Olaya Ponzone(3), Prof José Carlos García-Gómez(3)
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MC33 First marine mammals risk-assessment investigation along the strait of Sicily using fixed-line transects
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(3) Ketos Association, Catania, Italy.
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MC34 A Mediterranean monk seal as votive in the museum of Mycenae, Greece
Aliki Panou, Susanne Fisch Dimitratos
Archipelagos, Environment and Development, Strofiliou str. 26, Kifissia, Athens, GR-14561, Greece.

MC35 Five years of monitoring marine species along Sardinia and Sicily Channel: the threat of marine litter on marine biodiversity
Fabrizio Atzori(1), Dr Francesca Frau(1), Dr Maria-Francesca Cinti(1), Dr Lara Carosso(1), Dr Nicoletta Cadoni(1), Dr Stefano Corrias(1), Dr Stefania Lippi(1), Dr Susanna Cannas(1), Mirko Atzeni(1), Dr Giulia Atzori(1), Dr Veronica Mazzucato(1), Dr Maria Leonor Gutiérrez García(1), Giaime Mameli(1), Dr Giuseppe Andrea De Lucia(2), Dr Antonella Arcangeli(3), Marzia Mattia Porcu(1)
(1) AMP Capo Carbonara - Comune di Villasimius, Via Roma 60, Villasimius, Cagliari, 09049, Italy.
(2) IAMC–CNR. Italy.
(3) ISPRA. Italy.

MC36 Problem of the keeping of marine mammals in captivity in Ukraine
Kateryna Polyanska
Kudriavskiy uzviz , Kyiv, 04053, Ukraine.

MC37 Use of ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP) to monitor stripped dolhpins (Stenella coeruleoalba) in the Balearic Islands

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(2) Cetaceans and Marine Research Institute of the Canary Islands (CEAMAR), Calle Tinasoria 5, Playa Honda. CP 35509. Lanzarote (Las Palmas).
(3) Departamento de Zoología Marina, Instituto Cavanilles de Biodiversidad y Biología Evolutiva, Universidad de Valencia, P.O. Box 22085, 46071, Valencia.
(4) International Commission for the Conservation of Atlantic Tunas (ICCAT). Calle Corazón de María, 8, 6ª, 28002 Madrid.

MC38 Middelfart Listening Station – a successful story of a joint effort between multiple stakeholders

Jeppe Dalgaard Balle(1), Chris Pierpoint(2), Maria Palner(3), Jakob Tougaard(3), Katja Vinding Petersen(3), Line Anker Kyhn(3), Jonas Teilmann(3)
(1) Aarhus University, Institute for Bioscience, Frederiksborgvej 399, Roskilde, 4000, Denmark.
(2) Seiche Ltd., Bioscience Group, Bradworthy Ind. Estate, Langdon Road, Bradworthy, Holsworthy, Devon, EX22 7SF, United Kingdom.
(3) Section for Marine Mammal Research (SMAR), Department of Bioscience – Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark.

MC39 Dzharylgach: a newly discovered important area for cetacean conservation in the north-western Black Sea

Pavel Gol'din(1), Elena Gladilina(2), Oksana Savenko(2), Dr Karina Vishnyakova(2), Oleksandr Neprokin(2), Yulia Ivanchikova(3), Bohdan Hulak(4), Tatyana Derkacheva(5), Anna Kryukova(6), Kateryna Polyanska(7), Tatyana Voit(8)
(1) Schmalhausen Institute of Zoology, National Academy of Sceicens of Ukraine, Bogdan Khmelnitskyi 15, Kiev, 01030, Ukraine.
(2) Ukrainian Scientific Centre of the Ecology of Sea, Odessa, Ukraine.
(3) 11 Yakuba Kolasa, Kyiv, Ukraine.
(4) Southern Research Institute of Fisheries and Oceanography, Odessa, Ukraine.
(5) Mechnikov Odessa National University, Odessa, Ukraine.
(6) 11 Akademika Glushko, Odessa, Ukraine.
(7) International Charitable Organization "Environment People Law", Kyiv, Ukraine.
(8) National Nature Park "Dzharylgatsky", Skadovsk, Ukraine.

MC40 Do whale watching activities positively impact Tarifa village? A case of study in the Strait of Gibraltar

Lucía Merino González-Pardo(1), Alessia Scuderi(1,2,3), Javier García Sanabria(2), Prof Filomena Cardoso Martins(4), Sonia Méndez Regueiro(1)
(1) TURMARES Tarifa, Avenida Alcalde Juan Nuñez 3, 11380, Tarifa, Cádiz, Spain.
(2) Research group on Integrated Coastal Zone Management, Marine and Environmental Science Faculty, University of Cadiz, Spain.
(3) MMIRC LTD, Marine Mammal Information Research and Conservation, Gibraltar, United Kingdom.
(4) GOVCOPP and CESAM Research Units, Department of Environment and Planning, University of Aveiro, Portugal.

MC41 Understanding and reducing marine mammal tourism disturbance; the UK situation

Rebecca Walker(1), Sarah Dolman(2)
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(2) Whale and Dolphin Conservation.

MC42 CMS COP12 – Advancing towards a holistic conservation policy for marine species

Heidrun Frisch-Nwakanma, Melanie Virtue
UNEP/CMS Secretariat, UN Campus, Platz der Vereinten Nationen 1, Bonn, 53113, Germany.

MC43 Ship strike risk for blue whales *(Balaenoptera musculus)* in northern Chilean Patagonia is a growing concern

Alessandro Bocconcelli(1), Dr. Francesco Caruso(1), Dr. Laela Sayigh(1), Rafaela Landea-Briones(2), Dr. Gustavo Chiang(2), Dr. Paulina Bahamonde(2), Gloria Howes(2), Dr. Paolo Segre(3), Dr. Joe Warren(4), Leigh Hickmott(5)
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(4) New York University at Stony Brook.
(5) St. Andrews University, Scotland.

MC44 Influence of boat tourism on the behavior of beluga whales (Delphinapterus leucas) of the Solovetsky Island, Onega Bay, White Sea
Ekaterina Prasolova, PhD Vera Krasnova, PhD Roman Belikov, Anton Chernetsky
Shirshov Institute of Oceanology, Russian Academy of Sciences, 36, Nahimovskiy prospect, Moscow, Russia, Moscow, 117997, Russia.

MC46 Acoustic deterrent devices as a possible solution for reducing depredation of artisanal gill nets by bottlenose dolphin *(Tursiops truncatus)* in the Aeolian Archipelago (Italy)
Giusy Bonanno Ferraro(1), Chiara Bruno(2,3), Tessa Stockdale(2,4), Monica Francesca Blasi (2)
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(3) Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, Via F. Stagno D'Alcontres 31, 98166 Messina, Italy, Europe.
(4) University of York YO10 5DD United Kingdom.

NT NEW TECHNIQUES

NT01 Non-mammal marine macrofauna: a usable clue during cetologic fieldwork?
Adrien C. Gannier
Groupe de Recherche sur les Cétacés, France.

NT02 The possible use of unmanned aerial vehicles (drone) to collect informations on wild cetaceans health status
Davide Pedrotti(1), Dr. Cinzia Centelleghe(2), Dr. Marco Bonato(3), Dr. Joan Gonzalvo(4), Dr. Claudia Gili(5), Dr. Erika Esposti(5), Dr. Sandro Mazzariol(2)
(1) University of Padua, Viale dell'Università 16, Legnaro, Padova, 35020, Italy.
(2) Department of Comparative Biomedicine and Food Science, University of Padua, Italy.
(3) Department of Biology, University of Padua, Italy.
(4) Tethys Research Institute, Milan, Italy.
(5) Costa Edutainment spa, Acquario di Genova, Genova, Italy.

NT03 The last remains in marine top predators – simulated stomach content analysis in seals and their limited applicability to porpoises
Carolin Julie Neven(1), Dr. Timo Moritz(1), Matthias Mertzen(2), Dr. Harald Benke(1), Dr. Uwe Krumme(3), Prof. Dr. Steffen Harzsch(4), Dr. Michael Dähne(1)
(1) German Oceanographic Museum, Katharinenberg 14-20, Stralsund, 18439, Germany.
(2) Friedrich-Schiller-University Jena.
(3) Thünen Institute of Baltic Sea Fisheries.
(4) University of Greifswald, Zoological Institute and Museum.

NT05 Southern elephant seals (Mirounga leonina) 'nose- metrics' using image analysis in wild animals
Maria Chiara Vinesi(1), Andrea Cardini(1), Filippo Galimberti(2) and Simona Sanvito(2)
(1) Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, Via Campi, 103 - 41125 Modena - Italy
(2) Elephant Seal Research Group, Sea Lion Island, Falkland Islands, www.eleseal.org

NT06 Alternative techniques to osmium tetroxide to detect fat embolism in cetacean lungs
Marina Arregui(1), Dr. Yara Bernaldo de Quirós(2), Dr. Yania Paz-Sánchez(2), Dr. Eva Sierra(2), Tania Ramírez(2), Idaira Felipe-Jiménez(2), Dr. Manuel Arbelo(2), Prof. Antonio Fernández(2)
(1) University of Las Palmas de Gran Canaria, C/Velarde, 30, Las Palmas de Gran Canaria, Las Palmas, 35010, Spain.
(2) Atlantic Cetacean Research Center, Institute of Animal Health, University of Las Palmas de Gran Canaria.

NT07 A novel real-time acoustic monitoring system to assist in mitigation strategies for marine mammals during Dublin Port's Alexandria Basin Redevelopment Project

Heloise Frouin-Mouy(1), Clodagh Russel(2), John Moloney(3), Art Cole(3), Stephen Turner(3), Julien Delarue(3), Dr Joanne O'Brien(2), Dr Simon Berrow(2)
(1) JASCO Applied Sciences, 2305 - 4464 Markham Street, Victoria, British Columbia, V8Z 7X8, Canada.
(2) Irish Whale and Dolphin Group, Kilrush, Co Clare, Ireland.
(3) JASCO Applied Sciences Ltd, Dartmouth, Nova Scotia, Canada, B3B 1Z1.

NT08 X-band radar for the marine mammals tracking

Francesca Salvioli(1), Silvio Nuti(2), Francesco Raffa(3,4), Jessica Alessi(5,6), Gaspare Buffa(7), Francesco Serafino(8)
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(3) Institute of Geosciences and Earth Resources (IGG), Italian National Research Council (CNR), Pisa, Italy.
(4) Institute for Coastal Marine Environment (IAMC), Italian National Research Council (CNR), Messina, Italy.
(5) Associazione Me.Ri.S. Mediterraneo Ricerca e Sviluppo, Favara (AG), Italy.
(6) Department of Earth, Environment & Life Science, University of Genoa (GE), Italy.
(7) Institute for Coastal Marine Environment (IAMC-CNR) Detached Unit of Capo Granitola, Campobello di Mazara (TP), Italy..
(8) Institute of Biometeorology (IBMET), National Research Council (CNR), Florence, Italy.

OPENING SPEAKER

SUNDAY 8TH APRIL

Giuseppe Notarbartolo di Sciara

Giuseppe Notarbartolo di Sciara (b. Venice, Italy, 1948) is an Italian marine conservation ecologist who has contributed for 40 years to the advancement of knowledge of the natural history, ecology, behaviour and taxonomy of marine mammals and cartilaginous fishes.

He obtained in 1985 a PhD at the Scripps Institution of Oceanography (University of California, San Diego) with a thesis on the taxonomy and ecology of devil rays (of which he described a new species, Mobula munkiana).

Later, he progressively moved from science to conservation. Started (1986) the Italian national cetacean stranding network, which he coordinated until 1990. In 1986 he also funded the Tethys Research Institute, which he chaired and directed until 1997 and again from 2010 to 2016. In 1991 he spearheaded the creation of the world's first high-seas marine protected area, the Pelagos Sanctuary for Mediterranean Marine Mammals, established in 1999 by a treaty amongst Italy, France and Monaco. He was the President of ICRAM, the Central Institute for Applied Marine Research (1996-2003), a governmental body providing scientific support to Italy's marine conservation policy. He has served from 1999-2004 as the Italian Commissioner at the International Whaling Commission, and from 2002-2010 as Chair of the Scientific Committee of ACCOBAMS. He has taught science and policy of the conservation of marine biodiversity at the University Statale of Milan from 2007 to 2016.

Currently: CoP-appointed CMS Councillor for aquatic mammals (since 2014); Co-chair, IUCN Joint SSC/WCPA Task Force on Marine Mammal Protected Areas (since 2013); Deputy Chair, IUCN Species Survival Commission - Cetacean Specialist Group (since 1991); Member, IUCN Species Survival Commission - Shark Specialist Group (since 1993); Advisor, Pew Fellows in Marine Conservation (since 2003); Member of the Scientific Steering Committee of the Global Ocean Biodiversity Initiative (GOBI) (since 2013); Member of the Board of the Society for Marine Mammalogy (since 2012); Regional Coordinator for the Mediterranean and Black Seas, IUCN WCPA - Marine (since 2000);

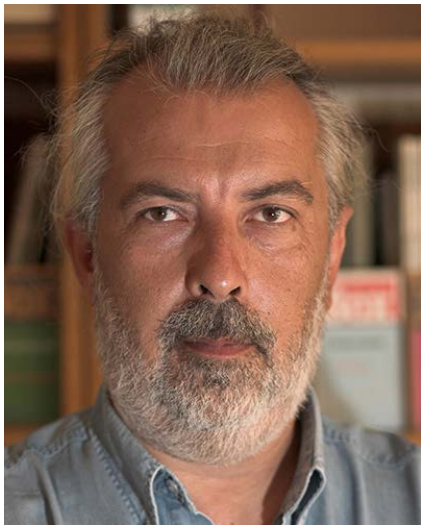
He has authored over 210 scientific works and books.
For more details:

www.disciara.org
http://en.wikipedia.org/wiki/Giuseppe_Notarbartolo_di_Sciara

KEYNOTE SPEAKER

SUNDAY 8TH APRIL

Spyros Kotomatas



Spyros was born in Athens, Greece in 1962. At the age of 9 he decided that he wanted to become a biologist and study the ecology of cheetahs (Acinonyx jubatus) in Africa. Towards this goal, he studied biology at the University of Illinois at Chicago, where he continued to receive his PhD in population biology. His thesis work, instead of dealing with wildlife, was a laboratory investigation of theoretical population regulation models under unfavourable environmental conditions. Upon his return in Greece in 1991, he managed to work on endangered species, as the Scientific Coordinator of MOm, the Hellenic Society for the Study and Protection of the Monk Seal. In 2007-2010 he held the position of the Director of MOm.

For the following 3 years he worked as an independent consultant on issues of nature conservation and environmental management. Since 2013 he is working for WWF Greece, as the Coordinator of the CYCLADES LIFE project, on the development of a new model MPA in the Aegean Sea. He has been involved in a variety of research and conservation projects in Greece and the Mediterranean and participated in a number of publications on the Mediterranean monk seal Monachus monachus. He has been especially involved in the design, establishment and operation of MPAs in Greece and in developing and implementing marine mammal conservation strategies. He is a member of various environmental societies and has served as a member of the National Committee for Protected Areas of Greece.

KEYNOTE SPEAKER

MONDAY 9TH APRIL

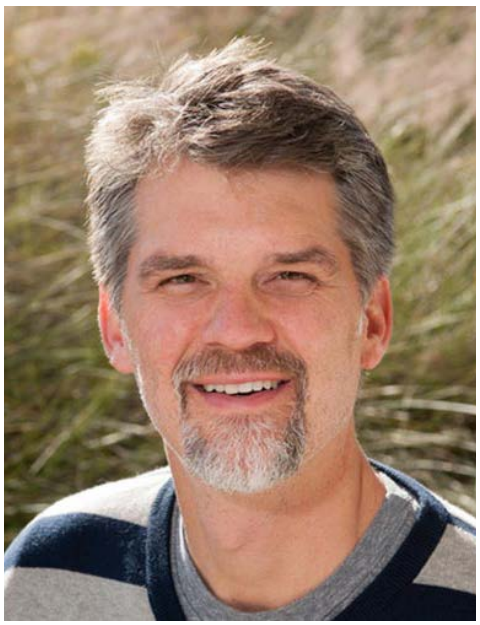
Maria Cristina Fossi

Maria Cristina Fossi is Full Professor of ecology and ecotoxicology at the University of Siena and since 2000 is Scientific Director of the Biomarker Laboratory (CIBM). She gave a key contribution to the development of the biomarker approach in terrestrial and marine ecotoxicology. Her research has focused on: development of ecotoxicological test in bioindicator organisms for off-shore and on-shore oil extraction (ENI-IT), evaluation of endocrine disruptors in marine species, assessment of cetacean ecotoxicological status in Mediterranean Sea, Gulf of California, Indian Ocean, investigation on presence and effect of macro and microplastics and plasticizers in Mediterranean ecosystems. Since 1991 she developed innovative diagnostic tools for ecotoxicological assessment of threatened species (marine mammals, birds, reptiles) bringing to the establishment of methods (non-destructive biomarker approach) currently acknowledged as golden standard at the international level. Thanks to her work on skin biopsies, she is a world reference for the assessment of ecotoxicological risk in cetaceans. Since 2001 she published the first papers on effects of on Endocrine Disruptors in Mediterranean marine top predators and long-living organisms. In 2012 she provided the first evidence worldwide on the effects of microplastics on baleen whales. She is author or co-author of over 580 original papers (research articles, review articles, chapters, books and abstract to international confererences; H-index = 32).
She was involved in the organization of more than 20 International Conferences and as Invited speakers in more than 40 Conferences. She is involved in several international scientific organizations (e.g. Past-president of SETAC Italian Branch, International Whaling Commission, UNEP/MAP, etc) and Editorial activities (e.g. Environmental Pollution, Frontiers). Her lab has a central position for research on marine litter on Mediterranean Sea and a key role in the implementation of the EU MSFD at national level. She has been panel member for evaluation of projects for EU Commission and international institutions (eg: Barcelona Convention, MISTRA, CIEMS, UN-SDSN, UfM, etc). Since 2013 he has been the scientific coordinator of the "Plastic Busters" project, born as part of the United Nations Sustainaible Development and Solution Network (SDSN) and elected as Flagship Project of Mediterranean-SDSN. The project, which involves 15 Mediterranean Partners, is devolved to monitoring and mitigating the impact of plastics in the Mediterranean and has received the "label" in 2016 from Union for the Mediterranean (UfM). She is involved in intense scientific communication and dissemination activity (media, magazines, web, film – "A Plastic Ocean") about the ecotoxicological effects of contaminants in the Mediterranean fauna and in particular on the emerging topic of the effects of microplastics in endangered species (particularly in the SPAMI Pelagos Sanctuary). During her scientific activities she has coordinated 26 national and international research projects and she participates as PI at 64 research expeditions in the Mediterranean Sea, Chile, Argentina, Mexico and Australia.

KEYNOTE SPEAKER

TUESDAY 10TH APRIL

Doug Nowacek



Nowacek is a University Associate Professor in the Nicholas School of the Environment and the Pratt School of Engineering at Duke. He earned his bachelor's degree from Ohio Wesleyan University and his Ph.D. from the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution. Nowacek has focused on the bioacoustics and behavioral ecology of marine mammals for over 20 years, primarily cetaceans, and his work also includes technology development for marine conservation research. In his joint appointments in the Schools of Environment and Engineering, Nowacek works to bring new technologies to compelling marine science and conservation research questions. One of the current marine conservation issues that is an emphasis for Nowacek is ocean noise and its impacts on marine animals, particularly mammals but also fish and turtles. Nowacek is also focused on ocean energy as a marine conservation issue. Nowacek has authored or co-authored more than 80 papers in the peer reviewed literature, publishing in top journals such as Science, Nature, Proceedings of the Royal Society, and the Journal of Experimental Biology.

http://www.europeancetaceansociety.eu/conference/opening-speaker

ORAL PRESENTATIONS

30 years of Marine Mammal Rescue in the United Kingdom

Stephen Marsh

British Divers Marine Life Rescue, 17 Cavendish Avenue, St Leonards on Sea, East Sussex, TN38 0NR, United Kingdom.

British Divers Marine Life Rescue was set up in 1988 following an outbreak of Phocine Distemper Virus that decimated the Harbour Seal (*Phoca vitulina*) population in the UK. Divers that assisted by recovering poorly animals to take into rehabilitation recognised there was an unmet need for a specialist organisation and so set up BDMLR. BDMLR quickly diversified into rescuing cetaceans as well and grew to be one of the largest marine mammal rescue charities in the world. Over the last 30 years it has trained circa 20,000 members of the public in rescue techniques and maintains a core of 3,500 trained volunteer medics who attend over 850 incidents a year. Around 90% of these involve seals, with 10% being cetaceans. Grey seals (*Halichoerus grypus*) taken into rehabilitation achieve a survival rate of around 90%, while only 25-45% of Harbour Seals survive. Of the cetaceans rescued, around 20% of single stranded animals are suitable for refloating, but over 60% of mass stranded animals are regularly returned to the water. BDMLR holds regular training courses for new volunteers and as refreshers for existing ones, also running stranding exercises where people can renew their skills and refresh their knowledge. The charity also travels further afield to share knowledge and skills and provides rescue advice to anyone who requires it around the world. As a member of the IWC's Global Whale Entanglement Response Network, BDMLR also disentangles large whales at sea around the UK and elsewhere in Europe. This presentation will look at the development of the UK's rescue response of species over the last 30 years, how public attitudes and their understanding has changed and how strategic partnerships with other NGOs, governmental organisations, rescue operations and scientists have helped, or hindered, their activity.

A simultaneous estimation of female and calves survival and breeding probability using multievent capture-recapture data

Pauline Couet(1), Morgane Declerck(2), François Gally(2), Prof Aurélien Besnard(1)

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(2) Groupe d'Etude des Cétacés du Cotentin, Cherbourg-Octeville, France.

Assessing the efficiency of conservation measures require reliable monitoring methods. Usually, monitoring programs aimed at estimating population size. This parameter results from various underlying demographic processes, like survival, reproduction and migration, which are needed to defined relevant management actions. For slow-growing mammal's populations, adult survival has the greatest contribution to population growth rate and sustainability. However, several studies have demonstrated that reproductive parameters can also drive population dynamics, so that they should not be neglected in monitoring design, even in long-lived species. Most studies on cetacean reproduction used descriptive methods such as count of new born, calving interval or reproductive success. These results, although quite interesting, could be biased by factors like variation in observation probabilities and uncertainty in mother-calf affiliation. Here we proposed a new approach, based on capture-recapture methods, to simultaneously estimate reproduction probabilities and survival probabilities for both females and calves. More specifically, we used multi-event models to account for uncertainty in mother-calf affiliation and temporal variation in the observation process. This method was applied on a year-round resident population of bottlenose dolphin (*Tursiops truncatus*) in the English Channel (France), which is studied since 2004. We showed that detection probability is higher for females with calves compared to ones without. The probability to give birth is greater for females that already have a calf, than for those who do not have one or loss it. This work is a joint collaborative project between a non-profit association and a research lab. The first one brings fieldwork and empirical knowledge and the second brings expertise in statistical method development. Such collaborations are extremely fruitful and should be promoted so that questions addressed are relevant for both managers and researchers, data collection is optimised in the field and analysis methods make the best use of data collected.

A story of size and depth: predator-prey interactions in the Bay of Biscay

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(3) IFREMER, EMH, rue de l'île d'Yeu, B.P. 21105, 44311 Nantes Cedex 03, France.

To ensure their survival, marine predators have to overlap spatio-temporally with their prey. Local prey size, quality, depth, aggregation and accessibility have been shown to be determinant in predator-prey spatial associations beside overall prey biomass. We explored small-scale spatial predator-prey relationships. We expected predators to be associated to higher relative biomass of locally available target prey, defined by predator-specific prey size ranges and foraging depths. Predator visual sightings and pelagic fish acoustic records were collected synchronously during PELGAS surveys in the Bay of Biscay from 2004-2014. The prey biomass was integrated by nautical miles and split into four prey size categories and two depth layers. For distances from 0 to 12 nm around predator sightings, we computed the relative biomass by prey size and depth to test whether predators occur close to or far from the highest prey biomass available. The study was conducted for the common *Delphinus delphis* and bottlenose *Tursiops truncatus* dolphins, as well as northern gannet *Morus bassanus* and northern fulmar *Fulmarus glacialis* for control. Gannets were positively associated to highest local prey biomass at sizes and depths consistent with their known diet, while no association was found in fulmars, as expected since they do not rely on small pelagic fishes. For the two dolphins, significant relationships with prey biomass were found at sizes and depths consistent with their known diet, but relationships were negative indicating that densities of fish were lower at shorter distances from the sightings than at greater distances. We argue this contrasted results reflect the response of prey facing predation. Seabirds are flying predators spotting their prey visually and attacking from above water, so predator avoidance is barely possible. On the contrary, cetaceans are acoustically active and negative associations are supposed to reflect anti-predator behaviour from prey, based on avoidance of echolocating predators.

Acoustic cues associated with cetacean mass stranding events

Laela Sayigh(1), Samuel Walkes(2), Seth Cones(2), Kathryn Rose(3), Alessandro Bocconcelli(4), Dr Mark Baumgartner(2), Dr Jim Partan(4), Brian Sharp(3), Dr Michael Moore(2)

(1) Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, Massachusetts, 02543, United States.

(2) Biology Department Woods Hole Oceanographic Institution Woods Hole, MA 02543, USA.

(3) International Fund for Animal Welfare Marine Mammal Rescue and Research 290 Summer Street Yarmouth Port, MA 02675, USA.

(4) Applied Ocean Physics and Engineering Department Woods Hole Oceanographic Institution Woods Hole, MA 02543, USA.

Mass stranding events (MSEs) can result in significant mortality or injury to odontocetes (toothed whales and dolphins), but little is known about their causes, posing challenges to prevention or mitigation. Our aim is to develop an acoustic mass-stranding alert system to aid responders in Wellfleet, MA, a hotspot for MSEs. To this end, we have deployed a recording device in Wellfleet Harbor since 2014, and we are comparing dates of dolphin whistle detections to dates of MSEs for common dolphins (*Delphinus delphis*) and Atlantic white-sided dolphins (*Lagenorhynchus acutus*). Acoustic detections were found to be significantly associated with MSEs (chi-squared, $p < 0.001$). We also looked for evidence of individually distinctive signature whistles in our recordings, given that high signature whistle rates have been associated with stress in bottlenose dolphins. We defined signature whistles as visually identified stereotyped contours, occurring three or more times within 1-10s of the same contour type. Pre-stranding detections had a greater proportion of signature whistles (Mann Whitney U, $p = 0.038$), and higher signature whistle rates (as measured by inter-whistle intervals; Mann Whitney U, $p = 0.005$) than non-stranding detections. Finally, in pre-stranding recordings, the number of signature whistle types was positively correlated with the number of stranded individuals ($p < 0.001$, $R2 = 0.78$), suggesting that most animals were producing their signature whistles. (This relationship could not be examined in non-stranding recordings, since estimates of group size were not available.) These results suggest that there are key differences in dolphin communicative behavior prior to MSEs vs. at other times, and may provide a framework for an acoustic alert system that aids responses to MSEs. Additionally, this research may shed light on the biology of MSEs, the causes of which have eluded researchers for decades.

Animal Sentience as a Key Issue in Marine Mammal Science and Policy in Europe

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(2) Whale and Dolphin Conservation.

In late 2017, animal 'sentience' suddenly emerged as a major political issue in the United Kingdom. This was in the context of the UK leaving the European Union and whether, or not, it would maintain the same animal welfare standards in the new domestic legislation being created to facilitate this change. There was public uproar when it appeared that the UK would not. Specifically, this related to a decision not to include language from or equivalent to Article 13 from the Lisbon Treaty (the Treaty on the Functioning of the EU) in the withdrawal bill. Article 13 requires, with respect to EU policies, that 'since animals are sentient beings' full regard needs to be paid to their 'welfare requirements'. The public concern generated (which peaked in the British media on November 21st) combined with a campaign for improved animal welfare standards, led to the rapid publication by the British government of a draft animal welfare bill on December 12th 2017, which is advertised as covering this matter. In this presentation we will focus on the meaning and application of sentience in marine mammal conservation and welfare, and the science that underpins this issue. A broad relationship is generally drawn between the quality of being 'sentient', the possession of 'feelings' and the ability to suffer. As marine mammals are typically regarded as 'highly sentient' this will affect policies that relate to them in Europe and the UK and we will consider how this may make them vulnerable to human activities and changes in their habitats. We will take as our main example the issue of bycatch, which is also presently at the centre of major development and revision of law and regulation in the UK and the EU.

Assessing the effects of humpback whale-based tourism in Vava'u, Kingdom of Tonga: Behavioral responses of whales to vessels and in-water tourism activities

Lorenzo Fiori(1), Dr Emmanuelle Martinez(2,3), Prof Mark B. Orams(4), Prof Barbara Bollard-Breen(5,6)

(1) Auckland University of Technology, 46 Wakefield , Auckland, 1010, New Zealand.

(2) Applied and Environmental Sciences Department, NorthTec, 0148 Whangarei, New Zealand TriOceans

(3)Marine Research and Technology Institute, Bay of Islands, New Zealand.(4) School of Sport and Recreation, Auckland University of Technology, 0627 Northcote, New Zealand.

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Vava'u, Kingdom of Tonga, is a well-established whale-watching destination in the South Pacific. Between July and October the waters around the archipelago represent one of the major breeding grounds for Oceania humpback whales (*Megaptera novaeangliae*). In addition, the Tongan government allows in-water interactions with whales, and tour operators strongly promote the practice of swimming-with-whales, targeting especially mother-calf pairs. However, there is increasing evidence, derived from empirical research on swim-with-cetaceans tourism, that this kind of interaction affects cetacean behavior and can lead to negative effects on the animals involved. This study represents the first assessment of humpback whales' behavioural responses to vessel and swimmer approaches in Vava'u. Furthermore, a large part of data collection has been conducted using a lightweight Unmanned Aerial Vehicle (UAV) to observe interactions from an aerial perspective. Fifty-six surveys took place during the 2016 and 2017 whale breeding seasons aboard dedicated research and swim-with-whales platforms. Whales' dive time, number of reorientation events and respiration rates were documented in absence and presence of boats and swimmers. Additionally, aerial videos of whales' behaviour and interactions with swimmers were recorded via the use of a Vertical Take-Off and Landing UAV flown at 30 m altitude. Vessel approach type and swimmer distance to whales were also noted. Results indicate that the average dive time and the proportion of time spent underwater in the presence of in-water tourism activities increased significantly for mother-calf pairs. Moreover, avoidance and agonistic responses of whales towards swimmers were frequently observed. Finally, extremely low levels of compliance to the existing Tongan swim-with-whales regulations were documented. These findings should be carefully considered by Tongan stakeholders and the governments of countries that allow in-water tourism interactions with whales to reduce the risk of detrimental effects on the targeted animals and potential injuries or fatalities for swim-with-whale tourists.

Assessing the population consequences of disturbance on migratory baleen whales via a dynamic state variable model of female lifetime reproductive success

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Human activities at sea can cause changes in animals' behaviour, but their impact on population dynamics is difficult to predict. Female baleen whales acquire most of the energy to sustain migration, gestation and lactation before a calf's birth. Therefore, disturbance that disrupts feeding behaviour can negatively affect calf survival through reductions in maternal body condition. This might have long-term repercussions on females' reproductive success and, ultimately, the status of a population. However, because baleen whales are long-lived, females may be able to compensate for failed reproductive attempts over the course of their life. We developed a dynamic state variable model, implemented via stochastic dynamic programming and forward Monte Carlo simulations, to predict the effects of disturbances on the long-term fitness of migratory baleen whales. The existing model for a single reproductive cycle was extended to identify optimal transitions among reproductive states (resting, pregnant or lactating) and optimal behavioural decisions based on time, location and blubber reserves of the female and dependent calf. The resulting model covered a female's entire lifetime, and was thus able to capture the processes of growth and sexual maturation. We parameterised the framework by integrating data on behaviour and physiology of Eastern North Pacific blue whales (*Balaenoptera musculus*). The effects of different patterns of human disturbance operating in the whales' range were assessed in the context of variable environmental conditions, including periodic climatic oscillations at different scales (El Niño and Pacific Decadal Oscillation) and stochastic events. Our modelling effort provides a general approach to assess the long-term consequences of disturbance on this, and other, migratory baleen whale populations. Therefore, it can support strategic management decisions regarding marine developments and activities in the face of a rapidly changing environment.

Biogeographical patterns of short-finned pilot whales in the Northeast Atlantic: in the search of an optimal habitat

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Information on biogeographical patterns of a species is crucial for our understanding of distributional ecology, which can improve the identification of key conservation needs. Here, we aimed to analyse movement patterns and spatio-temporal structuring of a highly mobile large marine predator, the short-finned pilot whale *Globicephala macrorhynchus*, over a wide latitudinal gradient covering the Macaronesian archipelagos (Azores, Madeira, Canaries, and Cape Verde) and the Iberian Peninsula. We used likelihood techniques to estimate residency times and transition probabilities from individual photographic-identification data, and analysed year-round distribution from effort-related sightings, collated between 1999 and 2015 from a major collaborative study. The best-fitting models included emigration and reimmigration, and showed different residency times within each archipelago. A total of 26 individual movements were recorded only between Madeira and the neighbouring archipelagos of the Azores and the Canaries (covering distances of 480 to 1200 km, and time-spans of 20 days to 8.4 years), and heterogeneous transition probabilities were estimated within and between these areas (from <0.01 to 0.1). Higher significant sighting rates were recorded during autumn in the Azores and Madeira. The variation in site fidelity and year-round occupancy found among areas of the Macaronesia is consistent with some degree of population structuring, where Madeira and Canaries seem to represent a special role. The heterogeneous structuring combined with a connectivity network and seasonal inflows from animals inhabiting offshore waters, suggest that short-finned pilot whales have developed a complex social and geographical ecology. These results support that any effective conservation measures for the species concerned should be made at least at the Macaronesian level, requiring the agreement of stakeholders from at least two countries. Finally, the present study, which involved nearly 30 organizations, highlights the importance of establishing effective strategic partnerships towards marine conservation.

Can codes of conduct limit impacts of vessel traffic upon bottlenose dolphins?

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In many parts of the world, recreational activities pose a threat to coastal dolphins. In the UK, three Special Areas of Conservation have been established to protect bottlenose dolphins. However, over the past decade, human pressures have increased markedly and at two of those sites, may be the reason for a reduction in their usage of the area. Careful management is needed to conserve this population whilst safeguarding its socio-economic value. This study aimed to examine the success of management plans in the two SACs which experience different levels of disturbance as well as different code of conduct compliance, evaluating behavioural impacts relative to vessel proximities. We conducted theodolite tracking and video surveys of dolphins and boats covering both SACs, to assess responses of different boat types (including distance, speed and direction in relation to dolphins) at the moment of encounter, and dolphin responses (changes in swim speed, orientation, group size). Results show differences in boat responses between SACs, boats keeping greater distances from dolphins irrespective of boat type in the site with a long-standing code of conduct, whereas at the less-regulated site, speed-crafts came closer to dolphins than other boats. At both sites, dolphins remained present during periods of high vessel traffic, but with significant increase to swim speeds and larger group size at the less-regulated site, whilst moving directly away from vessels. We conclude that dolphins maintain occupancy despite vessel presence but alter their behaviour during periods of high traffic, linked to code of conduct compliance. This study also elucidates the potential energetic costs to dolphins and ultimately the population-level consequences of disturbance from less-regulated leisure activities. Results highlight the value of enforcing regulations, contributing to an area-based management scheme that promotes species conservation alongside a sustainable ecotourism-industry.

Considering Rescue Attempts of Stranded Live Large Whales

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Live large whale stranding events present marine mammal response professionals with incredibly challenging scenarios. Many live large whales strand in poor body condition indicating chronic illness (supported by necropsy findings), and making them appropriate candidates for euthanasia. However, for the few that are deemed healthy based on a thorough examination by trained professionals, response options are often lacking and limited by available resources. Here, the authors present a case study of a live stranded subadult (6.6m) minke whale (*Balaenoptera acutorostrata*) that was successfully refloated, satellite tagged and herded out of Wellfleet Harbor, Massachusetts, USA on 9 November 2017. Physical examination found that the whale was responsive, in good body condition, had strong and consistent respirations, and no visible lesions except minor lacerations attributed to the stranding. The only notable abnormality was a bilateral slow pendulous horizontal nystagmus. Point-of-care blood analysis showed markedly elevated Creatinine (6.2) and lactate (8.67) with a mixed metabolic and respiratory acidosis (pH 7.253). Given the results of the assessment and favorable environmental factors (rising tide, firm substrate, calm seas, protected harbor, and daylight), an attempt was made to refloat the whale using a pontoon system developed by Project Jonah and refined by British Divers Marine Life Rescue. Prior to refloating, responders attached a temporary time-depth recording satellite tag (Wildlife Computers Splash 10-268) to the dorsal fin. In the first 37 days of satellite transmission, the minke whale had traveled more than 5,260 km to known minke whale habitat in the Caribbean. To the authors' knowledge, this is the first report of a refloated, satellite tagged, released stranded large whale that subsequently survived. While this response is considered a success, it should be emphasized that no rescue of a stranded whale should be attempted without a thorough health assessment by trained marine mammal professionals.

Describing favourable habitats of western Mediterranean teuthophageous species

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More that 50 squid species inhabit the Mediterranean Sea and half of the common cetacean species are preferential squid eaters. This suggests that teuthophageous cetaceans might be in competition for food and suitable habitats. Descriptive and multivariate analyses were carried out to explore this hypothesis. We processed our dedicated survey data in the northwestern Mediterranean, including the northern Tyrrhenian Sea, to extract 261 on-effort sightings obtained between 1988 and 2012, with corresponding effort: 146 observations of sperm whale, 39 of Cuvier's beaked whale, 36 of long-finned pilot whale and 45 of Risso's dolphin. While Risso's dolphin was present in the whole basin, other species were absent from parts of the study area. Five environmental variables (depth, slope, distance-to-200m-isobath (D200), monthly chlorophylle concentration and SST) were defined for every 3x3km cell in the western basin, as well as summer sighting rates using Pennington estimators for each individual species. Based on Kruskal-Wallis test, the observed habitats were not homogeneous for all species, excepted for SST: preferred depth was significantly distinct for each species; D200 was also distinct, with the exception of the pair Ziphius/pilot whale. Slope only differed for couples Grampus/pilot whale and sperm whale/pilot whale. Chlorophylle concentration was distinctly higher for pilot whale compared to the three other species. Based on a discriminant analysis (stepwise ascending mode), four variables contributed significantly (Wilk's lambda= 0.55) to habitat description of the four species, the most important of them being the depth. Discriminant function was highly efficient to classify Ziphius and pilot whale habitats (respectively 84% and 82% of success rate), but sperm whale was poorly discriminated from other species (33% correct prediction). Ziphius and pilot whale habitats were fairly separated, when those of sperm whale and Risso's dolphin largely overlapped. Based on published literature, these findings are correlated with known diet preferences.

Dolphin-Shark Interactions: Responses to Predation Risk and Non-Lethal Attacks

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Predation risk not only impacts population dynamics, but can also affect the way organisms interact with conspecifics and their environment. In Shark Bay, Western Australia, 74.2% of juvenile and adult bottlenose dolphins (*Tursiops aduncus*) bear evidence of shark-inflicted wounds, but little is known about how predation risk and non-lethal attacks relate to dolphin behaviour. In this study, we examined ecological, demographic, and social influences on predation risk and non-lethal attacks. Our results show a peak in shark attacks from January to March, with > 80% of shark attacks occurring between November and May. An individual's group size was negatively associated with the probability of having a shark scar. Scar frequencies did not differ with sex or age, although calves are less likely to survive attacks and be observed than older dolphins. Previous research showed that tiger shark density is highest in shallow habitats, such as seagrass. Not surprisingly we found that individual seagrass use was positively related to the presence of shark scars, whereas use of deep open habitat was negatively related. We also examined whether dolphins altered habitat use or grouping behaviour following an actual shark attack, but found no short- or long-term changes. Our results indicate that predation risk is higher for dolphins that (1) aggregate less often and (2) use seagrass habitats more often. Evidence indicates that dolphins might also mitigate the risk to calves by forming large groups. Following an attack, dolphins do not seem to alter their behaviour, possibly because their social and foraging patterns represent relatively stable socioecological strategies more broadly.

Ecogeographic and anthropogenic drivers of dolphin distribution: informing future spatial conservation planning in a marine protected area

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Information on which ecogeographic and anthropogenic variables affect species distribution is fundamental for understanding their ecology, and informing spatial conservation planning. Such spatial information is lacking locally, regionally and nationally, for most marine top predators in Australia, including those inhabiting multiple use marine parks. In this study, we used an ensemble modelling approach, combining five different species distribution modelling methods, to investigate the spatio-temporal distribution of southern Australian bottlenose dolphins (*Tursiops* cf. *australis*) in relation to a variety of ecogeographical and anthropogenic variables within the inner and outer areas of Coffin Bay, Thorny Passage Marine Park, South Australia. The analysis is based on data collected during systematic boat-based surveys in Coffin Bay between September 2013 and October 2015. Models of dolphin distribution for the entire Coffin Bay area indicated that distance to sanctuary zones was the most important variable influencing dolphin presence. Models for the inner area, where the sanctuaries are placed and a large proportion of dolphins are year-round residents, indicated that the main drivers of dolphin distribution were water depth, and distance to land and oyster farms. Overall, areas of high probability of dolphin presence in the inner area were associated with shallow waters (2 – 10 m), located within 1,000 m of land and 2,500 m of oyster farms. Despite the seasonality in environmental conditions and human activities in the study area, dolphins showed no temporal variability in their distribution patterns. Sanctuary zones covered areas from low (0.04) to high (0.89) probability of dolphin's presence, but the majority of areas of highest probability of presence fell within multiple use areas where human activities are allowed. Our results should support future spatial conservation decisions targeting dolphins in South Australia, and the modelling approach followed can be used to gain inference on the habitat requirements of inshore dolphins elsewhere.

Ecologically informed and dynamic distribution maps for cetacean communities in the north-eastern Atlantic Ocean

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Cetaceans are charismatic species with high cultural and commercial (e.g. wildlife tourism) importance. Consequently, the conservation of cetacean communities is considered paramount among regulatory bodies. Quantifying spatiotemporal variations in the absolute densities of animals is a fundamental component of effective conservation. However, the

cryptic movements of these species, in combination with the constraints of vessel and aerial surveys, make synoptic measurements of densities difficult at a continental and decadal scale. To overcome these challenges, the largest ever collation of surveys covering ~3 million kilometres and 30 years has been used to quantify associations between a suite of explanatory variables and observations of 10 regular species in the north-eastern Atlantic Ocean. These associations have then been used to predict absolute densities of each species at a 10km and monthly resolution between 1985 and 2015. A hurdle-model approach based on Generalized Linear Models (GLM) and General Estimating Equations (GEE) is first used to predict: (1) the probability of encounters using variables likely to determine the biogeographical range of a species through an influence on prey abundance, and (2) the density of animals if encountered using variables likely to create local-aggregations of a species within this range by increasing prey availability. Final predictions are obtained by multiplying probabilities of encounters by the density of animals if encountered. The use of ecologically informed rather than spatiotemporally explicit variables helps overcome issues with heterogeneous survey coverage. Outputs from these analyses allow overlap between cetaceans and anthropogenic activities to be identified, and for cumulative impact assessments to be performed. By understanding how species respond to oceanographic variables, these approaches also enable forecasting of community-level responses to different climate-change scenarios.

Environmental drivers of the large-scale movements of baleen whales in the mid-Atlantic Ocean

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Understanding the environmental drivers of movement and habitat use of highly migratory marine species is crucial to implement appropriate management and conservation measures. However, linking the large-scale movements of these species with information on oceanographic and biological processes collected at similar spatial and temporal scales is challenging. Here, we present the first study combining data from 33 satellite tracks of baleen whales (16, 10, and 7 from fin, blue and sei whales, respectively) from March to November (2008 - 2016) with data on physical oceanography and mid and lower trophic level biomass derived from a Spatial Ecosystem and Population Dynamics Model (SEAPODYM) to assess the influence of environmental factors on baleen whale movement patterns in the mid-Atlantic Ocean. A Bayesian switching state-space model was applied to the tracks (case points), and pseudo-absences were created through simulated positions using a correlated random walk model (control points). Based on the case and control points, we applied Generalized Additive Mixed Models (GAMMs) to determine the probability of occurrence and predict monthly distributions. Our results showed that movements were mainly influenced by the lower trophic level biomass, with animals migrating towards more productive areas along the study period. These patterns were also constrained by physiographic covariates, but their importance differed amongst the species, identifying the mid-Atlantic Ridge as a relevant habitat for fin and blue whales on their northward movement, but not for sei whales. In addition, contemporaneous features were compared against climatological ones, finding a different temporal resolution response between species. These novel insights highlight the importance of integrating telemetry data with spatially-explicit prey models to understand which factors shape the movement patterns of highly migratory species across large geographical scales.

From basis to Basins: Ireland's ObSERVE Programme as an Effective Strategic Partnership

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When it comes to surveying, understanding and conserving diverse cetaceans in Europe, Ireland's Atlantic area is

considered one of the most formidable and inhospitable environments there is. One consequence of this situation is that the knowledge-base used to inform conservation and management has tended to centre on more visible species and on late spring-summer months. However modern human activities, which may place external pressures on such species, are not confined to narrow windows in either space or time. To address some of these challenges and past shortcomings, the Irish Government initiated its ObSERVE Programme in 2014. This novel and strategic partnership between diverse Departments is focused around the management of sensitive habitats for cetaceans and other protected vertebrates. It has also set out to raise the bar in cooperation and coverage terms, in order to improve the quality and the interpretation of scientific data from Ireland's offshore. With total Government expenditure nearing €2.75 million to date, two ObSERVE projects that began in spring 2015 have just been completed. These projects have demonstrated how effective national and international collaboration and partnerships can be forged to inform us on, and to tackle, some daunting scientific and management challenges. Together the ObSERVE Aerial and ObSERVE Acoustic projects have resulted in almost all of Ireland's large EEZ being surveyed for a wide array of cetacean species and functional groupings, spanning all seasons and two successive years of data acquisition. Among the many outcomes of the Programme so far are (i) the operational validation and implementation of new methods to effectively survey in Ireland's Atlantic Margin, (ii) a vastly improved understanding of cetacean occurrence, abundance/density and seasonal variability in the study area, including for more cryptic species, and (iii) valuable and multi-faceted datasets which can be used for a wide range of future applications.

Genetic evidences of population decline in the harbour porpoise from Iberia waters over the last 30 years

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Impact of climate changes on species is expected to be especially visible at the extremities of species distributions, where individuals meet sub-optimal conditions. The harbour porpoises (*Phocoena phocoena*) is a good model to test this prediction, especially the meridional populations. In the North-East Atlantic, the harbour porpoise inhabits the coastal waters as south as the upwelling waters of Mauritania and Iberia, where two isolated populations of a distinct ecotype have been recently described (*P. p. meridionalis*). Here, we have analysed changes in genetic diversity over the last 30 years in the semi-isolated population of Iberia. We screened the genetic variation of a quarter of the mitochondrial genome encompassing five genes (ATP-6, ATP-8, COI, ND5 and Cyt-b) for two cohorts sampled at different time: one composed of 60 individuals sampled between 2012 and 2015 and an historical one composed of 82 individuals including 19 from Iberia sampled between 1990 and 2002. Phylogenetic analyses revealed for the first time evidence of migration from the Mauritanian population into the present-day Iberian population, suggesting this latter is not as isolated as previously thought. No significant difference in haplotype frequency was found between the two cohorts (*FST*=-0.002NS), but we detected a significant decrease in all the estimators of genetic diversity once accounting for differences in sample size and migration. Consistently with this, Tajima's *D* quantifying demographic trends showed negative values in both cohorts, with however a significantly less negative value in the contemporaneous cohort than in the historical

Harbour and grey seals' foraging ecology in the Eastern English Channel highlight potential competitive trophic interactions

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Harbour (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) are sympatric species occurring in the Eastern English Channel (EEC). Harbour seal colonies are established since the 1990's and increase (+31%/year), reaching nowadays around a thousand individuals. Several hundreds of grey seals were also observed in recent years (+49%/year) and may result from movements from the North Sea. In a context of potential competitive trophic interactions, we assessed their foraging ecology in the EEC by using a multi-disciplinary approach combining telemetry, stable isotopes and scat analyses. We analysed 283 harbour seal scats and 143 grey seal scats containing the remains of 6509 and 1388 individual preys respectively. Harbour seals' diet was mostly composed of juvenile and small flatfish (85% of ingested biomass [CI95%: 77-91]) including sole and plaice. Grey seals' diet was characterized by a higher variety of prey including 60% [55-66%] of the same flatfish species but larger in size, as well as 30% [26-34%] of round fish (mainly herring, whiting and pout) and 10% [6-14%] of squids. Carbon and nitrogen stable isotopes analysis of whiskers from 38 seals suggested a trophic overlap between the two seal species although grey seals generally fed on higher trophic level prey. The estimated total biomass consumed in 2015 and 2016 was 615 [547-683] and 657 [590-726] tons for harbour seals respectively, and 422 [386-458] and 578 [540-617] tons for grey seals. Lastly, telemetry showed that foraging areas of both species partly overlapped. Although some spatial and trophic partitioning was highlighted between the two species, harbour seals' trophic niche is included within the grey seals' one. The abundance of grey seals and their prey consumption will probably overtake that of harbour seals in the next years, potentially leading to an increase of competitive interactions which could affect harbour seal population dynamics.

Home range and overlap patterns of stable male Risso's dolphin (*Grampus griseus*) pods over time, linked to age class and behaviour: Adults rule over wide areas to socialize

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Gaining insights in the home ranges of marine mammals is crucial for the understanding of the general ecology of a species. Next, it may help to design focused (local) conservation management. Off Pico Island (Azores, Portugal), resident male Risso's dolphins (*Grampus griseus*) tend to form long-term, stable alliances of 3-12 individuals from the same age class. Therefore, the objective of this study was to compare and detect differences between home ranges linked with: (1) general behaviour states (Foraging, Travelling, Resting, Socializing) and (2) different age classes of the resident clusters. A long-term dataset was used to study their historical patterns over time. We used GPS positions and behaviour observed at first sight from seven male-pods (n=60) ranging from 10 to approximately 45 years of age. Data was collected between 2004 and 2016 off Pico Island (approximately 540 km2). Home range analysis (Minimum Complex Polygon and Kernel Density Estimator) were done using ArcGis 10.2 (with the Geospatial Modelling Environment toolbox). Home range overlap analysis were performed using R 3.3.3. Significant differences were found (KW, p-value=0.03341) in the home range sizes over the years for each pod. The smallest home ranges were found for young adults' pods, followed by an increased home range during mature adulthood and a decrease when becoming older adults. No significant differences were found on the overlap for all the behavioural states (KW, p-value =0.0009121). These results support a complex mating system in this species. The male alliances compete for access to females during the fittest mature phase of their lives, modifying their home range to defend and find fertile females, conform Clutton Brock's mating system classification (d).

How much does it cost to the maritime economy to reduce collisions' risks for large whales in the Pelagos sanctuary?

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30% of the world's maritime traffic transits through the Mediterranean Sea and the Pelagos Sanctuary for marine mammals also experiences heavy traffic, especially in summer. Collisions with ships are the main cause of non-natural

mortality for large cetaceans (Fin and Sperm whales). For now, the best available technology to reduce risks is the REPCET system that enables to share sightings of cetaceans so each vessel can make the best action to avoid collision. The objective of this study is to identify which company operates the vessels at greatest collision risk to optimize the equipment of the fleet with such system, and to evaluate the economic consequences of associated speed reduction scenario. Based on a multidisciplinary approach involving big data processing, the methodology has brought together one year of real ship traffic data from the AIS, plurennial data of cetacean abundance, mathematical and statistical models and mapping techniques. A comprehensive model has been developed to estimate the spatial distribution and magnitude of collision risk and so-called "near-miss events" at a 0.1°x0.1° resolution across the Pelagos region that demonstrate outstanding agreement with on board ferries monitoring during the same period. The results have demonstrated that less than hundred vessels, owned by less than 10 companies, have cumulated half of this traffic collision risk. Reducing speed to 10 knots during daytime in the reported risk zones would induce delays at port arrival. At the peak of the season, the most impacted vessel would experience, in one month of activity, cumulated delays of about 105 minutes maximum. It is highly unlikely that the delay at arrival for a single transit would exceed 30 minutes out of an 8 hours journey (6%). Additionally, this measure would save up to about 9 tons of fuel over a month of busiest activity, and reduce CO2 emission accordingly.

Is the use of acoustic alarms on gillnets the quick fix for fisheries with high bycatch rate of harbour porpoises?

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About 4600 small vessels use gillnets for cod (*Gadus morhua*) (half-mesh 8-12cm) and monkfish (*Lophius piscatorius*) (half-mesh 18cm) in the Norwegian coastal zone. Twenty monitored vessels were used to estimate bycatch rates of harbour porpoise (*Phocoena phocoena*). Bycatch rates were applied to landings statistics for cod and monkfish from the entire fleet using the same gear types to extrapolate total bycatch. The best model gave annual bycatch of 2946 (CV 0.11) porpoises for the period 2006-2014. We have since 2015 tested pingers (Future Oceans porpoise pinger and Fishtek's banana pinger) on gillnets for cod and monkfish. In the cod fishery 2535 net-weeks without pingers were compared to 1723 net-weeks with pingers. In nets without pinger one porpoise was caught per 282 net-weeks and in nets with pingers one porpoise was caught per 861.5 net-weeks, demonstrating a 67.3% reduction of the risk to be caught in nets with pingers. The catch of cod was 19% less in nets without pingers. In the monkfish fishery we compared 7084 net-weeks without pingers with 3411 net-weeks with pingers. The catch rates of porpoises were not different. There was no difference in catch of monkfish between nets without and with pingers. The fishers reported from 0 minutes to 75 minutes extra work per week to handle the nets with pingers. Some fishers also reported that pingers damaged the nets, but the questionnaire did not ask for quantification of gear damage. We do not know why the pingers performed different in cod and monkfish nets. We will in collaboration with the manufacturers explore changes of the pinger design to minimize damage to nets. We will involve more vessels and we will spend more time onboard for closer monitoring the functionality of the pingers. Pingers are not a quick fix yet, but we are coming close.

Is there hope for sustainable whale watching and swim-with whales in Reunion Island, Indian Ocean? Recreational and professional regulations during the last humpback whale (*Megaptera novaeangliae*) breeding season

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In the last decade, Reunion Island (Indian Ocean) has become a major breeding sites for humpback whales (*Megaptera novaeangliae*) with growing number of whales observed each year, few nautical miles away from seaside resorts. Consequently, recreational and professional whale watching (WW) and swim-with whale (SW) activities have tremendously developed, which raises concerns about the potential disturbances of humpback whales and challenges the sustainability of these activities. A responsible observation of marine mammals was therefore recently encouraged through a charter code-of-conduct under the initiative of WW operators, governmental and non-governmental organizations, as well as through a respectful cetaceans label for professionals. A dedicated team at sea was also appointed to observe, monitor and sensitize whale watchers and to ensure compliance with charter's guidelines. Following these measures, we assessed WW and SW activities in Reunion Island during the 2017 humpback whale

season from July to October. We investigated the circumstances leading to avoidance/neutral/approach responses of humpback whales to boats and swimmers numbers and behaviors. A total of 315 group sightings were recorded across 71 surveys with groups mostly composed of mother/calf pairs. 956 whale watchers boats including 76 SW trials accounting for 516 swimmers were recorded. Humpback whales avoided WW boats and SW encounters when there was non-compliance to charter's guidelines notably in terms of number, approach distance or inappropriate behaviors of boats and swimmers. Recreational swimmers were also reported on active groups, leading to challenging safety issues. Our results advocate for reinforcing tourism education with an emphasis on both underwater observation guidelines and cetacean behavioral understanding. This could be efficiently achieved with the existing charter, label development and a permanent team on the field to sensitize on sustainable values of these regulations, which bridges some gaps in the WW network between stakeholders with professional and recreational WW and state institutions.

Long-term effects of food provisioning on the reproductive success of free-ranging bottlenose dolphin population

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Human-wildlife interactions are frequently mediated by food-provisioning which facilitates predictable spatial and temporal up-close encounters. However, food provisioning may alter the natural behaviour of an animal, encouraging potentially adverse behavior, (e.g. begging for food handouts), it also may affect the reproductive success and, ultimately population viability. In Bunbury, Western Australia, a state-licensed provisioning program offers fish handouts to a limited number of free-ranging, bottlenose dolphins (*Tursiops aduncus*). The resident dolphin population is small (less than 200 individuals) and subjected to multiple anthropogenic stressors. Sensitivity analyses shows that reproduction greatly affect the viability of this population which is forecasted to decline at current level of reproductive output (Manlik *et al.* 2016, Ecology and Evolution). Thus, it is necessary to understand potential negative effects of food provisioning on reproductive success. In ensuring the long-term viability of the population, recruitment (i.e. total number of successfully weaned calves) is more important than reproductive output (i.e. total number of calves born per female). On average, bottlenose dolphins wean their calves at 3 years of age. We estimated reproductive success as the number of weaned calves during the years in which female has been reproductively active and compared the mean reproductive success of provisioned and non-provisioned females using Bayes Factor. Moreover, we used GLM to examine reproductive success and calf survival in relation to provisioning, begging and habitat type. Based on the long-term data available (> 10 years), both Bayes factor analyses (K=6.12) and results from the best-fitted models showed that both reproductive success and calf survival are negatively influenced by provisioning. Our findings highlight that wildlife provisioning in Bunbury lead to a decrease in calf survival, which can have significant effects on population dynamics, thus making this practice not sustainable, at present.

Low energy expenditure and resting behaviour of humpback whale mother-calf pairs highlights conservation importance of sheltered breeding areas

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Most baleen whales breed in low-productive, lower latitudes and feed in highly-productive, higher latitudes. Breeding areas provide suitable habitat for mothers to nurse calves for them to gain energy reserves to complete their migration to feeding grounds. Insights into mother-calf behaviours on breeding areas are crucial to understand biological and ecological requirements and to inform management about human activities that may impact whales within important habitats. To compare humpback whale behaviour and metabolic energy expenditure on both breeding (Exmouth

Gulf (EG), Western Australia) and feeding habitats (Godthåbsfjord, West Greenland; WG), we deployed high-resolution, multi-sensor Dtags on neonate calves (<3 months; n=8;) and their lactating mothers (n=16) in EG, and on adults in WG (n=16). Within both habitats, we quantified fine-scale behaviours and inferred energetic expenditure via respiration rates to investigate how mothers/calves prepare for long migrations. At EG, lactating females spent 22% of time resting (range 0-42%). Neonate calves spent 20.7% of time suckling (range 12.2-33.1%). Lactating females were never observed foraging on resting grounds. In contrast, WG whales spent 77% of time foraging (range 43-100%). In EG, lactating females (and calves) predominately rested (>75% of time) at depth (4-8m) and out-of-sight from human observers. Lactating females in EG had significantly ($p<0.0001$) lower respiration rates (mean 0.74+0.27 respirations/min) than adults in WG (1.37+0.27 respirations/min). In summary, lactating females accompanied by suckling calves spent significant time resting with little energy expenditure, presumably conserving energy before their long migration to Antarctic feeding grounds. Conversely, on feeding grounds, humpback whales facilitate rapid energy intake by spending a significant amount of time foraging before their energetically-demanding migration to breeding grounds. These results are valuable to inform current plans for port development in EG, an emerging local swim-with-tourism-industry, ship-strike modelling and provide evidence of the importance of resting areas to lactating females and their dependent and vulnerable offspring.

Low genetic diversity, limited gene flow and widespread genetic bottleneck effects in a threatened dolphin species, the Australian humpback dolphin

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Numerous species of marine megafauna are at risk of extinction and understanding their genetic population structure and demographic history is essential for their conservation. We used mitochondrial DNA and 18 nuclear microsatellite loci, on the largest genetic dataset compiled to date on Australian humpback dolphins (eight sampling sites, 159 samples), to assess their genetic diversity, gene flow and past demographic history along the east coast of Queensland, Australia. Levels of genetic diversity were low (mtDNA: $h = 0\text{-}0.52$, $\pi = 0\text{-}0.007$; nDNA: $Ho = 0.27–0.41$; $AR = 1.7–2.4$). Both mitochondrial ($\Phi ST = 0.49$, $P = 0.001$) and nuclear markers ($FST = 0.14$, $P = 0.001$) showed strong genetic structure among sampling sites. Four putative populations were identified, with little contemporary gene flow ($m = 0.017$ to 0.047) among populations. Genetic divergence follows an isolation-by-distance model ($r = 0.38$, $P = 0.0001$), with an apparent restriction in gene flow occurring at scales of 382-509 km. Estimates of contemporary effective population size were low ($Ne = 11.5\text{-}31.2$), with signatures of genetic bottlenecks for all putative populations about 50-150 generations ago. The current low levels of genetic diversity, gene flow, and effective population size in Australian humpback dolphins indicate the effects of historical population bottlenecks and/or founder events during the late Holocene period (~ 1250-3750 years ago); probably associated with sea level fall and increased intensity of El Niño Southern Oscillation -climatic events. Our results raise important conservation concerns and emphasizes the vulnerability of Australian humpback dolphins to stochastic demographic, genetic and environmental processes. Conservation strategies should focus on promoting connectivity among local populations and reducing direct causes of human-related mortality.

Marine traffic alters the behavioural budget of bottlenose dolphins in the Istanbul Strait, Turkey

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While lethal effect of marine traffic on cetaceans has been long recognised, its non-lethal impacts, i.e. behavioural disruption and habitat alteration, have only been given attention only recently. The current study is the first to investigate the effect of marine traffic on the behaviour of bottlenose dolphin (*Tursiops truncatus*) through Markov Chain analysis within the Istanbul Strait (Bosphorus), Turkey, between September 2011 and October 2013. Surveys were carried out over the course of 308 days (1,631 hours), of which dolphins were encountered in 164 days (204 hours). The results confirmed that marine vessels were the main driver behind behavioural transitions. Behavioural budget, including their cumulative (daily) budget, and bout length (average time spent in each behaviour), was sufficiently changed at the current vessel exposure level (51%). While surface-feeding, resting and socialising behaviour significantly decreased in the vessel presence, diving behaviour showed a significant increase. These behavioural changes are likely to cause both a decline in energy acquisition, and an increase in energy expenditure. The Istanbul Strait is characterised as one of the busiest international waterways with up to 2500 vessels daily. Repeated behavioural disruptions are likely to affect the survival and reproduction of each animal, which ultimately leads to population level effects. These results are alarming, considering the potential biological consequences on the population. The bottlenose dolphins in the area are listed as "at risk" and lack species-specific conservation plans at present. The results of the current study must be considered immediately to delineate "Particularly Sensitive Sea Areas" in order to mitigate the vessel-dolphin interactions not only within the strait but also in the adjacent waters.

Migratory convergence allows simultaneous cultural convergence and transmission of humpback whale song across the South Pacific

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Cultural traits are important in a wide variety of taxa from birds to humans. Male humpback whales sing a complex, stereotyped, and culturally transmitted song display. Acoustic contact on shared migratory routes may provide a mechanism for cultural transmission of song across vast oceanic regions. Here, song recordings from the Kermadec Islands, a potential migratory stopover, were linked to the South Pacific breeding grounds of New Caledonia, Tonga,

Niue and the Cook Islands, but not to French Polynesia or east Australia. After acoustic isolation at the breeding grounds, simultaneous cultural convergence and easterly transmission of song occurred at the Kermadec Islands. This provides direct evidence that simultaneously operating cultural mechanisms result in the unprecedented ocean basin-wide cultural phenomenon that is South Pacific humpback song transmission.

Multi-state open robust design models for dealing with incomplete sampling and imperfect detection: an example with sperm whales and opportunistic photo-ID data

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Information on abundance and demography is essential to assess the status of populations, inform conservation and management measures and evaluate effectiveness of those measures. Application of capture-mark-recapture (CMR) methods to photo-identification data has been extensively used to estimate abundance and life history parameters of cetacean populations. Yet, the challenges and costs of obtaining longitudinal observations of wide ranging marine animals frequently hampers CMR studies. Use of opportunistic photographic data may be an alternative, if modeling takes into account potential biases from imperfect detection and incomplete sampling. We applied covariate-based open models (POPAN) and multi-state open robust design (MSORD) to estimate demographic parameters of sperm whales summering in the Azores from data collected opportunistically by whale watching operators and researchers. Best fitting POPAN models accounting for heterogeneity in capture probabilities estimated annual abundances with a positive trend ranging from 351 (95%CI: 234-526) to 718 (95%CI: 477-1082). Best fitting MSORD models, which explicitly incorporated permanent and temporary emigration and uncertainty from imperfect detection, showed little inter-annual variation in abundances, ranging from 275 (95%CI: 174-436) to 367 (95%CI: 230-585). Both POPAN and MSORD models estimated constant and high survival of sperm whales 95% (CV=0.07) and 93% (CV=0.12), respectfully). MSORD models also indicated individual sperm whales had short residency times in the study area and there was an equal flow of animals in and out of the area between years. This study demonstrates the potential of MSORD models to overcome the many challenges associated with the analysis of opportunistic data from wide ranging species. By accounting for imperfect and variable detectability, this model can reduce bias and improve precision of abundance and demographic estimates.

Multidisciplinary studies on a sperm whales' mass stranding

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Sperm whales' (*Physeter macrocephalus*) mass strandings remain peculiar and rather unexplained events. In September 2014, 7 whales were found stranded along the Italian coastline of the central Adriatic and, while 4 animals were extraordinarily refloated, 3 animals died on the shore. During necropsies of these 3 individuals, a complete set of tissues were collected and preserved for microbiology, genetics, virology, parasitology, stomach content and stable isotopes analysis, toxicology and for microscopic examination. A nested RT-PCR was used to investigate evidences of dolphin morbillivirus (DMV) along with immunohistochemistry (IHC) using an antibody targeting canine distemper virus nucleoprotein antigen. Finally, gas and fat embolic syndrome was assessed. The 3 dead individuals were all females belonging to the same Mediterranean population and social unit; the wind and marine currents pushed get them towards the beach where they died. Postmortem analyses revealed that the older female, likely the stranded pod's leader, was pregnant and exhibited an hydronephrosis secondary to a large kidney stone. All the animals were infected by DMV with an immunopositive reaction confirming the infection. Scant and highly digested food remains and the parasitic burden support the hypothesis of a non recent feeding as confirmed also by stable isotope analyses. Gas and fat embolic syndrome was excluded as well as ongoing military exercises and seismic surveys. The results of postmortem analyses revealed that the 7 sperm whales entered the Adriatic Sea encountering adverse conditions and followed northward the ill and pregnant leader of the pod toward the stranding site. DMV infection could have played a crucial role in impairing their health condition and in recognizing the way towards the high seas. In fact, molecular and IHC analyses support the hypothesis of an infection at a very initial phase associated to a "general discomfort condition" secondary to the viral circulation.

ObSERVE-ACOUSTIC: Strategic partnerships between government departments and research providers deliver a large scale, offshore, multi-annual acoustic survey off western Ireland

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Ireland's Exclusive Economic Zone extends 200 nautical miles from the coast and covers an area of approximately 450,000 km2. To date, 25 cetacean species have been recorded either from visual observations or strandings, and all populations and their habitats are protected under national and EU law. The ObSERVE-Acoustic project aimed to carry out acoustic monitoring along the shelf edge to provide robust data with which to inform conservation management by assessing the importance of these shelf edge habitats for whales and dolphins. Between 2015 and 2016 a total of

nearly 3.8 million detections of odontocetes using clicks and 375,000 detections of baleen whales and dolphins using whistles were collected during 1,657 days of static acoustic monitoring (SAM) at eight locations. During 3,984 nautical miles of passive acoustic survey effort across the shelf edge using a towed hydrophone, a total of 24 million candidate clicks during 1,322 click events were detected and 1,484 whistle events. The data were collected from extreme depths (1800-2000 m) and in challenging offshore environments. At least 13 species were identified acoustically including five mysticetes and eight odontocetes. These data were used to determine species distribution and relative abundance and enable modelling to predict surface densities. Density estimates were generated for sperm whales using distance sampling. Seasonal and diel patterns were explored and the influence of slope and canyon habitats on the presence of cetaceans. Density of all species increased with maximum slope, with habitat preferences for odontocetes associated with different depth zones. ObSERVE-Acoustic confirmed the importance of the Atlantic Margin off western Ireland for blue, fin, long-finned and sperm whales and Cuvier's and Sowerby's beaked whales. We review ObSERVE-Acoustic to deliver the appropriate data for managing Irish offshore waters.

Origin and spread of phocine distemper virus in 1988 and 2002

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The 1988 and 2002 phocine distemper virus (PDV) outbreaks in European harbour seals (*Phoca vitulina*) remain the largest mass mortality events recorded among marine mammals. Still, despite its large impact on harbour seal population health and three decades of studies, little is known about the temporal origin and spread of PDV – in part because of limited sampling and genomic coverage. Here, we sequenced 7,123 bp of the PDV genome in a total of 44 harbour seal samples collected across the European range of the 1988 and 2002 outbreaks. Time estimates of the most recent common ancestor found that the virus population from the 1988 epidemic originated between May 1987 and April 1988 while the virus population from 2002 originated between June 2001 and May 2002. Based on the results an introduction linked to the mass migration of harp seals in the winter and spring of 1987-1988 seems likely. The vector for the 2002 outbreak is still unknown, but the genomic data suggests that the spread from the epicentre in Kattegat to locations in the North Sea happened as several independent waves of PDV transmission.

Predicting dolphin distribution within an Important Marine Mammal Area (IMMA) in Greece to support spatial management planning

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The success of a marine protected area depends on knowledge of distribution and habitat use by the species it aims to protect. The Gulf of Corinth, a 2400 km2 semi-enclosed embayment in Greece, has been identified as an Important Marine Mammal Area (IMMA) based on the satisfaction of all four selection criteria for IMMA status. In this area, three

odontocete species can be predictably encountered within 11 km of the nearest coast: striped dolphins *Stenella coeruleoalba*, common dolphins *Delphinus delphis* and common bottlenose dolphins *Tursiops truncatus*. Striped dolphins occur in single-species groups or in mixed groups with common dolphins, whereas bottlenose dolphins only occur in single-species groups. We used a seven-year (2011–2017) dataset comprising 29907 km of boat-based visual surveys and 3448 km (590 h) of dolphin follows to predict striped and bottlenose dolphin distribution in the entire Gulf. Multiple geographic, bathymetric, oceanographic and anthropogenic variables were incorporated in a combined generalized additive model and generalized estimation equation framework (GAM-GEE) to describe dolphin occurrence and construct maps of predictive distributions. Modelling indicated that striped dolphins prefer deep (>300 m) oligotrophic waters in the central and southern part of the Gulf; bottlenose dolphins prefer shallow (<300 m) waters and areas close to fish farms along the northern-central shores. Spatial distribution of dolphin suitable habitats was predicted by using the retained variables identified in species-specific models. Prediction maps of dolphin distribution identified 1) a core dolphin habitat of approximately 1600 km2 (encompassing two thirds of the entire Gulf surface), and 2) a clear partitioning of striped and bottlenose dolphin distribution, calling for separate management measures within each species' core habitat, threatened by different anthropogenic impacts of concern. The results of this study can inform spatial management and ensure meaningful conservation action, consistent with IMMA designation.

Satellite tagging of C-type killer whales in the Antarctic: insights toward the Ross Sea Region conservation objectives

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The fish-eating killer whale ecotype (C-type) is regularly present in the coastal area of the Ross Sea (Antarctica). In the austral summer 2015, ten C-type killer whales were equipped with LIMPET satellite transmitters in Terra Nova Bay (Ross Sea) to investigate their movements and habitat use. Hierarchical switching state-space models (hSSSM) were applied to Argos tracking data to characterize the horizontal movement and behaviour of tagged whales. The mean tracking duration was 28.6 days (standard deviation: 8.8), ranging from 19 to 44 days. All tagged whales engaged in convoluted movements (ARS - area restricted search) indicating potential foraging activity in two coastal area of the Ross Sea located around the Campbell, the Mariner and the Borchgrevink glacier tongues. Results also highlighted transit behaviour between these two area and a rapid and uninterrupted 5,000 km travel northbound from the end of the Antarctic coast towards New Zealand, without any evidence of potential foraging activity. Area of Restricted Search in the coastal area of the Ross Sea accounted for the 25 %, transit and uncertain behaviour for the 71% and 4% of the total, respectively. The behaviour patterns and broad spatial scale of movement exhibited by tagged individuals have important implications for the understanding of the ecology of C-type killer whales in the Ross Sea Region. Particularly, these results will inform the spatio-temporal management of the Ross Sea Region Marine Protected Area (MPA) and improve conservation measures in place in the Antarctic Special Protected Areas (ASPA).

Sex Bias, Social Preferences and Social Learning in Bottlenose Dolphin Tool-Use

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For over 30 years, we have documented foraging tool use with marine sponges, hereafter 'sponging', in about 5% of the

bottlenose dolphin (*Tursiops aduncus*) population in Shark Bay, Australia. This represents one of the best-documented cases of tool use for any wild cetacean. Strong evidence suggests the behavior is vertically transmitted through social learning from the mother, with 59% of sons and almost all daughters of spongers adopting the behavior. Sponging also has a strong ecological component in that it occurs almost exclusively in relatively deep channels where there is a high abundance of basket sponges. Here we examine the maternal and non-maternal effects that contribute to social learning sponging. Our sample includes 23 female and 23 male offspring born to 30 female spongers who were observed during focal follows and/or surveys. Why are males less likely to use tools than females? One hypothesis is that sons are less interested in maternal foraging behaviour than daughters. Another non-exclusive hypothesis is that mothers create different social and/or ecological environments for sons compared to daughters. To examine this, we focused on 3 potential contributors to social learning: (1) exposure of male and female calves to associates that varied in age, sex and foraging status (sponger vs. non-sponger) (2) calf exposure to foraging behaviour of one or more types (by the mother and non-mothers), and (3) preference and avoidance patterns (fission-fusion) according to sponging status and sex. We found that mothers foraged differently near sons compared to daughters. Association patterns also differed depending on offspring sex. Finally, although spongers generally prefer to associate with each other, there was no indication that spongers avoid non-spongers or vice versa. These results suggest that mothers change their behaviour in subtle ways to reduce the chances that male offspring will adopt sponging.

Signal type determines the scope for amplitude adjustment to noise in bottlenose dolphin (*Tursiops truncatus*) whistle communication

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Anthropogenic underwater noise has increased over the past century, which has raised concern about the impact on cetaceans that rely on sound for communication, navigation, and locating prey and predators. Many terrestrial animals increase the amplitude of their acoustic signals to partially compensate for the masking effect of noise (the Lombard response), but cetaceans have been suggested to almost fully compensate for increasing noise levels by such amplitude adjustments. Here, we use sound-recording tags on pairs of bottlenose dolphins (*Tursiops truncatus*) to test (1) if dolphins increase signal amplitude to compensate for increasing ambient noise and (2) whether or not adjustments are identical for different signal types with distinct functions. We present evidence of a Lombard response in the range of 0.1-0.3 dB per 1 dB increase in ambient noise, which is similar to that of terrestrial animals, but much lower than the response reported in previous cetacean studies. Also, we find that the magnitude of this response is greater for non-signature than signature whistles, indicating that the latter has a smaller scope for amplitude compensation to noise. The consequence is a loss of active space during periods of increased noise, which has implications for many ecologically important behaviours including group cohesion, conspecific encounter rates, and mate attraction.

The ACCOBAMS Survey Initiative – when a dream comes true

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The "ACCOBAMS Survey Initiative" (ASI) is a pilot initiative aimed at establishing an integrated and coordinated monitoring system for cetaceans throughout the ACCOBAMS area. This initiative is conducted in coordination with riparian countries and in line with their commitments related to the implementation of European and regional policies, in particular the Marine Strategy Framework Directive (EU) and the Ecosystem Approach process (Barcelona Convention UNEP/MAP, Bucharest Convention). A synoptic survey will be carried out in summer 2018 throughout the Mediterranean Sea and Contiguous Atlantic area. The survey will combine visual survey methods (aerial surveys) and passive acoustic monitoring (PAM), with the participation of local scientists. A multispecies approach will be applied during data collection; cetaceans will represent the main target, while data on marine turtles, sword-fish, giant devil rays and seabirds will also be collected. During the surveys, line transect sampling methodology will be applied and density and abundance will be estimated both through design-based and model-based approaches. The survey design has been completed, with different strata according to geographical, oceanographical and known cetacean habitat characteristics, as well as to jurisdictional issues. A systematic design with Equal-Spaced-Zigzag design has been created for each strata in Distance 7.0 to ensure equal coverage probability. The aim was a 6% coverage (166,064 km on-effort) divided in two replicas of 3% each. Similar effort is planned for the coming years in the Black Sea, with the ASI final goal to obtain an overall picture of the distribution and abundance of cetaceans throughout the entire ACCOBAMS Agreement area, providing robust estimates to be considered as baseline data for further systematic monitoring programmes, comparable amongst all areas. These data will improve the current knowledge on cetacean status, facilitate the development of targeted conservation and mitigation measures and allow the development of effective long-term monitoring programmes.

The growing Important Marine Mammal Area (IMMA) Network: an update on the global process for informing the management practices of place-based marine conservation

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Important Marine Mammal Areas (IMMAs) are a place-based conservation tool identifying discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. The IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force is in the process of identifying a global network of IMMAs through a series of regional expert workshops between 2016-2021. Three workshops were held in 2016-2018, covering the Mediterranean, Pacific Islands, and North East Indian Ocean and South East Asian Seas regions, engaging over 100 local experts. The results of these workshops derived from Areas of Interest (AoI), proposed by the scientific community at large, as candidate IMMAs for over 40 species of marine mammals, including cetaceans, pinnipeds and sirenians. A further three workshops are planned for the Western Indian Ocean and Arabian Seas (2019), Australia-New Zealand waters and South East Indian Ocean (2020), and the South East Tropical and Temperate Pacific Ocean (2021). Each workshop follows a predefined process, carried out in consultation with the marine mammal science and conservation community, resulting in a range of knowledge products for use by marine researchers, managers, and decision makers in each target region. These include a spatially-explicit IMMA layer accessible via an IMMA e-Atlas and an Inventory of Knowledge summarising a data appraisal of expert information. In addition, using key examples from each of the workshop areas, the Task Force will investigate how best to implement one or more IMMAs per region with specific area-based management recommendations. These workshops will help to create regional Task Force groups who will act to ensure the effective uses and future evaluation of IMMAs in international and national conservation and management initiatives including Key Biodiversity Areas (KBAs), Ecologically or Biologically Significant Areas (EBSAs), Marine Protected Areas (MPAs) and Marine Mammal Protected Area networks.

The importance of a subarctic feeding ground for humpback whale song transmission to subtropical breeding grounds in the North Atlantic Ocean

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The cyclically-repeated song of the male humpback whale is an important social display on their breeding grounds, functioning in male-male interactions and/or as a reproductive display to attract females. Either way, these songs, containing phrases repeated within sequential themes, ultimately influence the reproductive success of the singers. Humpback whales are capable of song copying and innovation, which results in continual song evolution and horizontal transmission between individuals. The song transmission is important for vocal convergence within a population, and for sharing song components with other breeding populations within the same ocean basin. Here, we present evidence of cultural transmission of songs between a subarctic feeding ground (Iceland) and two subtropical breeding grounds (Cape Verde Islands and Lesser Antilles) in the North Atlantic. Recordings of humpback song from these locations were decomposed to the phrase level. Utilising Markov matrices and similarity analyses (Levensthein distance, Levenshtein distance similarity index and Dice's Similarity Index), the level of song exchange between Iceland, the Cape Verde Islands and the Lesser Antilles in the Caribbean from 2011-2012 was quantified. Songs recorded in 2011 on the Icelandic feeding ground and at the same time on the Cape Verde breeding ground formed a single song cluster, demonstrating pronounced song similarity. Songs recorded in the Cape Verde and the Caribbean the following year (2012) formed different song clusters but shared 53% of themes with each other. Sharing of themes between years was also evident indicating that the song evolved. Results clearly suggest that songs are transmitted between individuals on the joint Icelandic sub-arctic feeding ground, producing a similar pattern to the North Pacific. This highlights the importance of Iceland as an area for song exchange in the North Atlantic.

The Western Mediterranean basin like a pathogens soup? A source of growing concern for cetacean species inhabiting the Pelagos Sanctuary

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The detection of disease agents affecting stranded cetaceans provides effective information about the health status of the marine mammal populations and the marine environment in general, and may increase public awareness of deteriorating marine ecosystems health. Between 2015 and 2017, 23 cetaceans were found stranded along the Ligurian coast of Italy, in the Pelagos Sanctuary. Thanks to the surveillance activity of the National Reference Centre for diagnostic activities on dead stranded cetaceans (C.Re.Di.Ma.), a total of 17 necropsies were performed (17/23, 74%) and a cause of death had been determined with confidence in 13 cases (13/17, 76%). Infectious disease was the most common cause of death, involving 12 cetaceans (12/13, 92%). Interestingly, 6 of these cases (6/12, 50%) were characterized by severe coinfections involving cetacean - specific viruses and pathogens with zoonotic significance (e.g. *Salmonella enterica* serovar Typhimurium monophasic variant 1,4 [5],12:i:-, *Listeria monocytogenes*, *Brucella ceti* ST26) and/or indicative of environmental contamination (e.g. protozoal pathogens like *Toxoplasma gondii* and *Sarcocystis* spp, fungal pathogens like *Aspergillus fumigatus*). To our knowledge, published reports on some of the aforementioned pathogens in marine mammals are rare, and little is known regarding the environmental factors affecting their persistence in the marine environment as well as the contamination of marine organisms. All cases were analysed in detail, focusing on the pathogenic role of the agents identified, the association with the pathological findings (specific or not) in the central nervous system and/or in other organs and tissues, and the most likely source of exposure, considering the characteristics of the concerned coastline. These results highlight the role of cetaceans as sentinel species for zoonotic and terrestrial pathogens in the marine environment, and suggest a potential increase of sea water contamination along the coasts of North Western Italy, which may adversely impact cetaceans and human health.

Time matters. Why we should consider more the temporal resolution of our studies

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The temporal resolution is critical when studies concern highly mobile species, as they interact with dynamic oceanographic processes that vary at time-scales from seconds to decades. Synoptic surveys aimed to assess abundance of species at the large scale have generally a temporal resolution, ranging from days to few weeks. Aim of this study is to outline the lessons learnt from the analysis of a long time series regarding occurrence, spatial and temporal distribution of cetacean species in an area of about 24,000 km2 included within the Pelagos Sanctuary in the NW Mediterranean Sea. The data series derives from 28 years of dedicated shipboard summer surveys, conducted between 1990 to 2017. Indices of spatial pattern (e.g. index of patchiness, measures of Centre of Gravity and Inertia) have been applied to the sighting data of the most frequent species (i.e. *Stenella coeruleoalba*, n: 3847, *Balaenoptera physalus*, n: 933) and their variability was analyzed in time. Both the species encounter rates (ANCOVA $P<0.01$) and the spatial distribution patterns (Kruskal-Wallis $P<0.01$) were found affected by significant temporal variability. The spatial distribution of the two species was in fact found more clumped (minimum distance between single-season sightings of 7 to 12 km) or dispersed (maximum distance between sightings: 35-38 km) in some years with respect to others suggesting some correlation with environmental covariates. These results show that the temporal variability of distribution patterns has the potential to make less accurate and not entirely comparable, the estimates of population size that can be obtained through line or point transects studies conducted at different times. The knowledge offered by long term monitoring studies about the species spatial distribution may provide a straightforward support to the design of time-constrained transect-based studies.

Wildly irresponsible or responsible for the wild? An urgent call for welfare science at whale mass strandings

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New Zealand has an international reputation not only for its high incidence of pilot whale (*Globicephala melas*) strandings, but also its extensive degree of public engagement at such events. On average, 2.4 mass strandings events per annum occur, predominantly in the austral months of November to February. Between January 1978 and February 2017, a total of 132 pilot whale mass strandings occurred, involving an estimated 9,234 whales. Despite costly,

logistically challenging efforts to 'rescue' live whales, there remains a disconcerting lack of empirical data to support such efforts. Furthermore, matters of animal welfare, including the impacts of human manipulation and the fate of 'rescued' individuals remain largely undetermined. While the importance of understanding the outcomes for refloated animals has long been recognized, a lack of scientific evaluation, especially in relation to post-rescue monitoring, means the fate of individual whales remain unknown. Historically, animal welfare science and conservation have been regarded as separate disciplines, with dissimilar objectives that often conflict. However, the newly emerging field of conservation welfare has started to align these disciplines more closely, with the aim of improving both animal welfare and conservation outcomes. In putting conservation science into practice, scientists, conservationists and managers alike may inadvertently induce significant detrimental impacts upon the welfare of the animals that they seek to conserve. However, the ethical and scientific foundations of decision-making regarding stranded whales, have yet to be explicitly explored in any detail. We explore how recent advances in Artificial Intelligence (AI) can be used to challenge perspectives associated with human intervention at mass stranding events. Within the context of a record breaking 600 whale stranding event in 2017, we examine social, ethical and animal welfare issues surrounding rescue attempts and offer considerations for future discourse, research and practice in the broader context of conservation welfare.

Would habitat models for deep-diving cetaceans be improved if prey distributions were included?

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In habitat modelling, environmental variables (e.g. depth, slope, sea surface temperature) are assumed to be good indicators of lower trophic levels distribution and thus good proxies of top predator's distribution. However, as marine top predators are supposed to be mostly sensitive to prey abundance, the use of more proximal variables, such as prey distribution, could refine relationships between species distributions and their environment. Nevertheless, field data

on prey distributions are not available at a large scale. To cope with this gap, a numerical model, the Spatial Ecosystem And POpulation DYnamics Model (SEAPODYM), provides simulations of the distribution of zooplankton and of six functional groups of the micronekton at the global scale and was recently extended to predict turtle and cetacean habitats. Consequently, we aimed (1) at exploring if fitted models using prey distribution data better predict deep-divers distribution (here beaked and sperm whales) than fitted models using more conventional environmental data and (2) at testing whether the combination of environmental and prey distribution data would further improve model results. To do so, we compared the performance of three Generalised Additive Models that used environmental variables, SEAPODYM variables and a combination of both variable types. It appeared that for the two species groups, models using SEAPODYM variables were slightly better than models using environmental variables but more importantly, models using both variable types were more performant than the two others. Overall, deep-divers were closely related to static features (high depths and steep slopes) but also to high biomasses of bathypelagic and epipelagic organisms and low biomasses of highly migrant bathypelagic species, which was consistent with the known diet of the species groups. These results are encouraging and the combination of environmental and prey distribution variables could be a key improvement in predictions of species distributions through habitat models.

Retrospective study of foreign body-associated pathology in stranded cetaceans, Canary Islands (2000-2015)

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The Canary Islands (CIs) shelter up to 30 different cetacean species. Marine pollution has increased exponentially worldwide due in part to the use of plastic since half of the last century (2). Thirty-six out of 465 (7.74%) cetaceans necropsied, referring to 15 species stranded in the CIs from January 2000 through December 2015, presented at least one foreign body (FB). Occurrence of FBs was higher in Risso's dolphins (4/12; 33.33%), sperm whales (6/28; 21.43%), *Mesoplodon* sp. (4/19; 21.05%), followed by Cuvier's beaked whales (5/33; 15.15%) and mysticetes (2/17; 11.76%). Eight out of nine cetacean species affected by FB (88.89%) are present year-round. Main FB-associated lesions included ulcerative gastritis with presence of luminal blood (14/36; 38.89%), impacted stomach (9/36; 25%), gastro-intestinal perforations (3/36; 8.33%), ulcerative glossitis (2/36; 5.56%), stomatitis (2/36; 5.56%), cicatrized ulcers (2/36; 5.56%) and petechias (1/36; 2.78%). Plastics were present in 80.55% of FB cases (eg. bags), ropes/threads (19.44%), metal filaments (8.33%), cloth elements (2.78%), electric wires (2.78%) and glass fragments (2.78%) were found in the gastric compartments. FB was directly associated with death in 13 out of 36 (36.11%) animals. Poor body condition and deep diving behavior were found to be a risk factor for FB ingestion (FBI) meanwhile the adult age was a protective factor. This study reveals detrimental effects of anthropogenic marine debris on free-ranging cetaceans in the CIs and may poses scientific fundament for future conservationist policies.

SHORT TALKS

A comparison of high-resolution digital aerial surveys and passive acoustic monitoring

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The German long-term monitoring program for marine mammals along with the construction and operation of offshore wind farms consists primarily of a combination of two different methods: passive acoustic monitoring (PAM), providing continuous data at a few stations inside and outside the wind farm areas, and high-resolution digital aerial surveys, providing monthly data covering areas of >2,500 km^2. So far several studies could show a close connection of absolute densities derived by conventional visual aerial surveys and detection rates recorded by PAM-devices. However, since temporal and spatial scale are very different between both methods, these comparisons are extremely scale-dependent and therefore relative vague. A new-implemented digital high definition video system to monitor marine mammals reach a much higher coverage of the survey area compared to visual aerial surveys. This provides an excellent data set to be compare with recordings of PAM-stations along the transect lines. Altogether we were able to analyze data of 115 aerial surveys and 29 PAM-stations (C-POD). First results revealed a significant positive correlation between absolute densities derived by digital aerial surveys and detection rates (PAM) for the area with highest porpoise densities. In further analysis we will investigate if this correlation is density dependent and the effect of different spatial and temporal scales on the outcome will be reviewed.

A simple method to obtain reliable estimations of dolphins group size

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Effective estimates of cetacean abundance from visual transect surveys need unbiased estimates of group size. Estimation of the size of a group of free-ranging animals is a difficult task and estimates vary considerably among observers. Schools of dolphins represent an hard case, because groups are highly mobile, with an unknown number of individuals hidden below the surface at any moment. The aim of this work was to i) estimate average proportion of dolphins surfacing at any moment (hereafter ASD) in a group, ii) evaluate ASD variability and, iii) assess the amount of instantaneous counts - of surfacing dolphins at any moment - needed to obtain reliable group size estimations. During sea state conditions ≤1, we used drone multicopters to collect nadiral videos of fifteen schools of striped dolphins (*Stenella coeruleoalba*) in "travelling" activity state. For each video frame containing ≥1 surfacing individual, the number of dolphins above/below the surface was calculated. 100,000 random extractions of single video frames per school have been used to compute non-parametric analysis. For each extraction the ASD of each frame has been averaged frame by frame by increasing the number of frames analyzed. Overall, the ASD was 0.38 (SE=0.08; 95%CI=0.25-0.53 with narrowest 95%CI recorded in large groups). Although the information from few frames was enough to stabilize the ASD, its coefficient of variation needed information from thirteen frames to drop under a value of 0.20. According to these results, group size estimations of striped dolphins can be obtained multiplying the number of dolphins surfacing at any moment for a value of 2.6. However - for any sighted group of dolphins - a minimum of thirteen different instantaneous counts of surfacing animals are needed to obtain a reliable averaged group size estimation.

Beaked whale distribution and habitat use from acoustic surveys in the North-East Atlantic

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c/ Arbre del Rei nº56, 2º1ª, Sant Feliu de Guíxols, Girona, 17220, Spain.

Beaked whales are deep-diving cetacean species that rely on echolocation to forage. Their poorly understood ecology, along with their long dive periods and short surface intervals make them an ideal target for large-scale acoustic cetacean surveys. CODA (2007) and SCANS-III (2016) surveys provided visual and acoustic information on distribution and abundance of cetaceans in the oceanic and shelf waters of the North-East Atlantic. The acoustic datasets of both surveys were analysed in this study with the aim to detect beaked whale events in the North-West European Atlantic, and to fit models that could estimate and predict their distribution during summer as a function of a series of environmental

covariates. Based on species-specific echolocation signals, beaked whales were divided into two categories: "Sowerby's beaked whales", with a click peak frequency of ~67 kHz, and "Other beaked whales" (presumably Cuvier's beaked whales and Northern Bottlenose whales), with a peak frequency around 40 kHz. A total of 18,582 km were surveyed acoustically. Both species were detected in the area and in both surveys' datasets ("Sowerby's": n=12; "Other beaked whales": n=17). Distribution of Sowerby's beaked whales was found to be related to sea surface temperature; while distribution of "Other beaked whales" was related to depth. Overall, surface maps of beaked whales' predicted distribution matched with the acoustic detections and showed three main areas with high probability of occurrence: the North-West waters off Ireland and UK, the South of the Bay of Biscay, and the North-West waters off Spain. These findings could add extra knowledge to beaked whales' ecology, helping inform EU member states of their status. Moreover, these results can help identifying beaked whale hot-spots in the North- East Atlantic to effectively manage and evaluate human activities on these areas, with a special focus on anthropogenic mid-frequency sounds to which beaked whales are sensitive.

Abundance assessment of sperm whales (*Physeter macrocephalus*) in the North-Western portion of the Pelagos Sanctuary (NW Mediterranean Sea)

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The Mediterranean sub-population of sperm whales is classified as 'Endangered' on the IUCN Red List. No estimate of population size currently exists for the Mediterranean region, while abundance estimates are available only for some areas. Aim of this study is to assess the size of sperm whale population using the North-Western portion of the Pelagos Sanctuary area in the summer period, through mark recapture (MR) methods. Accordingly, a combined photo-identification dataset was created by merging the catalogues owned by Tethys Research Institute (TRI) and CIMA Foundation (CIMA), both operating in the North-Western part of the Pelagos Sanctuary, covering an area of approximately 30,000 Km2. Out of 356 sightings (n= 326 TRI; n= 32 CIMA), collected between 1990 and 2014, a total of 136 different individuals were identified based on fluke markings. Individuals sighted more than once, up to 18 times, represented the 60% of the total captures. 20% of the resightings occurred within the same season but many individuals were resighted across different seasons (50 %). The longest interval between two resightings was 11 years. Data were pooled based on the homogeneity of the photographic effort. Abundance estimates were calculated based on both closed and open population models. For closed population models, the field season and the bimonthly unit were chosen as primary and secondary sampling interval, while open population models concerned a three years' sampling interval. Although in recent years, sperm whale encounter rates were documented to increase in the area, open population models suggest instead a stable population in the range of 43-56 individuals (CV=0,40) showing an high site fidelity. MR analysis confirms that the Pelagos Sanctuary is a critical area for the species, although further investigations are needed to improve the understanding on sperm whale habitat use and on how it correlates with environmental variability.

Boat traffic negatively influences diel rhythmic behaviour in harbour porpoise in Skjálfandi Bay, Iceland

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There are only a limited number of published studies investigating impact of nautical traffic on cetaceans; few studies consider *Phocoena phocoena* behaviours. Skjálfandi Bay, Iceland, is a popular whale-watching destination, where harbour porpoises are commonly seen. Understanding the impact of maritime vessels on cetacean behaviour within the

bay is fundamental for conservation, management, and policy implementations. This is the first study to evaluate diel rhythmic behavioural changes in *P. phocoena* as a direct result of maritime vessels within Iceland. To quantify porpoise disturbance by marine traffic, two C-PODs (acoustic data loggers) were deployed for a total of 1,392 hours: one at a site heavily impacted by vessel activity, the other at a site with significantly less disturbance. Automatic Identification System data was utilised to determine boat density surrounding each C-POD. Strong diel rhythmic behaviour was present at the site less heavily impacted by maritime presence, but completely absent at the disturbed site. This study demonstrates for the first time that nautical traffic significantly affects diel rhythmic behaviour in harbour porpoises in Iceland.

Delphis – a Modern Technology and Open Standards for Coastal Cetacean Surveying Application

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Delphis was designed to be used in the relatively unique conditions of marine surveys. Choosing commodity mobile device enables anyone to perform a survey with their own device as well as dedicating low-cost-low-end devices. Key components are designed with no constraint, so users may choose to use any database or visualization platform (as well as develop their own), database can be populated with data from other sources. Delphis uses open standards to facilitate easy data integration and sharing with other entities and platforms. It is designed to grow and accommodate other features and strives to be as tolerant as possible, featuring an ability to use multiple devices for the same survey, bounce surveys between multiple devices and other such features. Our goal is creating an end-to-end platform to collect, retain and analyze data from marine platforms, while minimizing errors in data collection and facilitating a geo-centric approach with easy and coherent visualization of real time, analytical data. Data is collected using commodity Android-based mobile devices, logs GPS data as well as other metrics (time, bearing, speed, etc), and is categorized as points of interest that may be enriched with media assets (photos, videos, audios). Delphis provides the user with a real time map and visual information of traveled course, bearing, speed, depth, etc. Delphis has several user-support features to facilitate accurate and enjoyable surveys (reminders, auto-home-base-detection, expert-mode, etc). From a technical standpoint, Delphis employs a loose-coupling architecture between key components to enable easy data exporting/importing and sharing, to enable a broad range of analysis tools and to offer flexibility in the future. Delphis was created by a nonprofit organization facilitating high-end technology for marine mammal researchers; since the launching of this tool in October 2016, a total of 2980 nm has been covered throughout 144 marine mammal coastal surveys.

Enhancing pinniped management and conservation via stakeholder engagement and non-invasive genetic sampling

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Grey (*Halichoerus grypus*) and harbour (*Phoca vitulina*) seals are protected under European legislation requiring amongst other obligations the restoration/maintenance of a Good Environmental Status. In Irish waters, implementation of EU legislation is hampered by lack of samples and knowledge gaps regarding population structure. Management Units suggested thus far are based on geographic areas and limited telemetry data, which is sub-optimal. This project aims to assess population genetic structure and long-term changes in genetic variability for both species (I) in Irish waters and (II) in relation to seals from other European countries. Innovative aspects of this project are active stakeholder engagement, which resulted in a large number of collaborators, and the use of non-invasively collected samples increasing sample number significantly, not just in the field but also in rehabilitation centres where non-invasive sampling is in agreement with their respective ethics committees. At present, 17 collaborators are involved in the project encompassing research institutes, state agencies, museums and rehabilitation centres. 446 and 490 samples

for *P.vitulina* and *H.grypus* respectively have been obtained in just over one year of sampling. Methodologies for non-invasive sampling, DNA isolation and amplification of target DNA from various sources (e.g. scat, moulted hair) have successfully been validated, showing that non-invasive sampling can provide insights into population genetics of Irish seals. Experiments in semi-controlled environments have shown that DNA can reliably be obtained from scat after a four-week period, enhancing sampling opportunities in the field. DNA from moulted hair of grey seal pups has been extracted allowing for lanugo samples of late stage IV and stage V pups. Experiments will provide information regarding probabilities of cross-sample contamination. This project shows that conservation and management of protected marine mammals can benefit significantly from using non-invasive techniques in combination with active stakeholder engagement (e.g. devising Management Units at an appropriate scale).

Fishermen help scientists reveal far reaching movements of minke whales from coastal North Sea to deep Atlantic habitats

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Fishermen are often in conflict with marine mammal conservation, due to either habitat destruction from trawling, competing for the same prey or dead animals end up as bycatch in fishing gear. In case of the Danish pound net fishermen a fruitful partnership with scientists have persisted for more than 20 years. Pound nets are used to trap live fish for human consumption and provide the highest fish quality with little or no discard of dead fish. This sustainable fishery regularly catch live harbour porpoises, and in two cases, 14 years apart, also live minke whales were trapped. In June 2003, a 5 meter long subadult minke whale was caught alive near Skagen harbour at the northern tip of Denmark. Fourteen years later, in the same pound net another 4 m long minke whale was caught alive. The whales swam calmly around in the net until the net was lifted to the surface and the whales were held alongside the fishing boat. An Argos satellite transmitter was attached with three nylon pins to the dorsal fin. Contact remained for almost three months with the first whale while the other is still transmitting after 5 months (December 2017). The whales showed similar movements; within a few days both whales moved north leaving the North Sea and spending most of the time on the continental slope west of Ireland, around Atlantic offshore seamounts and islands and along the mid-Atlantic ridge. The whales were swimming 11,500 and 10,000 km, respectively, with an average speed of 133 and 66 km per day. The second whale spending longer time in specific places, presumably foraging. Cooperation with fishermen giving these unique opportunities to tag minke whales have provided both the longest track durations, but also insights to unknown seasonal habitat use of the minke whales.

From brick to bullet: Using Computational Fluid Dynamics to design bio-logging tags with minimal drag

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Bio-logging devices are used across taxa in movement and behavioural ecology to record data from organisms without the need for direct observation. Bio-logging technology has become more sophisticated in recent years, but less progress has been made in assessing and reducing the impact of attaching these devices to animals, despite concerns about the ecological usefulness of the data collected, and implications for animal welfare. Existing guidelines typically focus on tag weight (e.g. the '3% rule'), yet ignores the impact of aero/hydrodynamic 'drag' that is likely to be more important for aerial and aquatic organisms. Designing tags for animals moving in fluid environments is, however, not trivial, because tagged animals are subject to forces in turbulent flow and the impact of drag is a function of the position of the tag on the animal and its form and dimensions. These problems are further compounded by the fact that the position of the tag on the animal determines the quantity and quality of data that are attainable. To efficiently tackle this complex optimisation problem, we take an interdisciplinary approach and use Computational Fluid Dynamics (CFD) to design tags with minimal impact. We use the grey seal (*Halichoerus grypus*) as a model species to investigate the effects of several principal factors in telemetry design, including form, dimensions and tag position on the animal. We demonstrate that optimising a combination of these factors can substantially reduce drag, and highlight the counter-intuitive result that smaller tags are not always better. We conclude that CFD can be successfully used for optimising tag

design and outline a recently developed optimisation algorithm.

Genetic investigation on the population structure of the harbour porpoises living in Turkish waters by double digest restriction associated DNA (ddRAD) sequencing

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Harbour porpoise, *Phocoena phocoena* is found in cold temperate to sub-polar waters of the northern hemisphere. In the Turkish waters, it is predominantly found in the Black Sea; however, it is less common in the Turkish Straits System (TSS) and the Aegean Sea. In the present study, a ddRAD-seq data set, consisting of 857,934 base pairs and 4924 single nucleotide polymorphisms (SNPs), of 55 harbour porpoise samples was generated. The samples were collected between 1999 and 2017 in the Turkish Black Sea coast (31 western, 6 eastern), the TSS (17), and the Aegean Sea (1). This study comprises the first use of the ddRAD-seq for a cetacean species living in the TSS and Aegean Sea. The highest percentage of genetic diversity was detected in the Western Black Sea (37%) followed by the TSS (30%), suggesting that the populations in these regions may be ancestral. On the other hand, pairwise FST values were significantly different between all populations, suggesting that gene flow between these populations may have been reduced in recent ecological timescales. According to the phylogenetic tree analysis, individuals with the mtDNA haplotype XVIII (a unique haplotype in the Marmara Sea) were located on different branches of the tree, without any distinct grouping. However, some clades which included individuals from the TSS and with the haplotype XVIII clustered together. A very rigorous conservation strategy is needed to ensure the protection of harbour porpoises especially in the Marmara Sea, since they hold the unique mtDNA haplotype (XVIII), and due to possibility of isolated groups implied by the results of ddRAD analyses.

Kinematic and acoustic analysis of herring-eating killer whale feeding behaviour during different prey life-stages

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Herring-eating killer whales are specialized on a type of prey that undergoes changes in behaviour throughout the year. Challenges faced in each of herring life-stages may cause killer whales to modify their behaviour accordingly. Sound and movement data registered in archival tags were analysed to assess how variables related to feeding behaviour differed across prey life-stages. Deployments were performed on killer whales in Norway and Iceland during overwintering, feeding and spawning life-stages. Angular deviation in heading over five-minute periods illustrated movement circuitousness degree. Acoustic events were marked. Tail slaps produced by the tagged individual (focal) were identified by a rapid change in pitch, and considered as capture. Tail slaps occurred consistently at higher angular deviation periods in all life-stages, but the proportion of focal tail slaps from the total was higher during feeding and spawning contexts, that registered lower absolute detections of non-focal tail slaps. The depths of focal tail slaps reflected differences across life-stages. Mean depths were $\bar{x}$ =15.25m (SD=14.37) during overwintering, $\bar{x}$ =66.13 (SD=17.11) during feeding and $\bar{x}$ =33.85m (SD 10.41) during spawning life-stages. Echolocation production was associated with higher values of angular deviation only during overwintering. Buzzes were more commonly produced after a tail slap during feeding and spawning life-stages, suggesting they may assist in the handling of prey when the water is turbid. Roll movements during the tail slap sequence differed across contexts: whales rolled upside-down more often after a tail slap during feeding life-stage, whereas during spawning tail slaps were performed upside down. Roll behaviour could be related to the use of visual cues, but there was no clear statistical support. Feeding using tail slaps appeared to be a commonly employed strategy. Life-stage particularities in the depths where feeding takes place, the use of echolocation and the roll behaviour suggest predator behavioural adaptations potentially advantageous at each context.

Long-Term Temporal and Spatial Patterns of Polychlorinated Biphenyls in UK Harbour Porpoises (*Phocoena phocoena*)

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Polychlorinated biphenyls (PCBs) are persistent and lipophilic chemical compounds that pose a health risk to humans and wildlife. Cetaceans are particularly vulnerable to the toxic effects of PCBs because they bio-magnify and bio-accumulate. Using tissue samples collected between 1990 and 2015 we investigated the spatial distribution and temporal trends of concentrations of PCBs in the blubber of 765 UK-stranded harbour porpoises (*Phocoena phocoena*). Concentrations of PCBs declined between 1990 and 2008, then "stabilized" subsequently between 2009-2015 in England, Scotland and Wales. There was significant geographical variation in PCB concentrations with the lowest blubber concentrations in Scotland and the highest levels in England. Some degree of atmospheric transport may also be occurring, causing some PCBs to be transported from industrialized to less industrialized regions. Our study has shown that concentrations of PCBs in the blubber of harbour porpoises remain at levels that pose a significant toxicological threat. More emphasis is urgently needed to reduce the input of legacy PCBs into the environment and mitigate the risk, including enhanced efforts to comply with the Stockholm Convention for PCBs.

Marine mammal observer data - unexpectedly finding missing pieces of puzzles and helping scientists build a bigger picture about blue whales in the Indian ocean

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Despite being the largest animal that has ever lived on Earth there are, perhaps surprisingly, equally large knowledge gaps especially in terms of the movements and distribution of blue whales (*Balaenoptera musculus* sp). Such knowledge gaps are particularly prominent in remote offshore areas where there is limited research effort. Two recent geophysical surveys in the Indian Ocean have revealed important information on the presence of blue whales in this region. Data collected by trained and dedicated Marine Mammal Observers (MMOs) onboard geophysical vessels in the offshore waters of Kenya and Sri Lanka revealed a significant occurrence of blue whales in these waters during the south-east and south-west monsoon seasons, respectively. Within Kenyan offshore waters, a total of 30 sightings of 38 individual blue whales were recorded during September and October 2014. These are the first known at–sea sightings of blue whales off the Kenyan coast, potentially identifying another important habitat for these whales. More recently, a total of 28 sightings of 37 individual whales were recorded during July and August 2017 in Sri Lankan waters. These records provide a strong, further indication of resident blue whales within the offshore waters of Sri Lanka. Photos taken during both surveys are currently being matched to photographic records contained within the existing catalogue of North Indian Ocean pygmy blue whales and the Southern Hemisphere Blue Whale Catalogue (SHBWC). It is hoped that such work will lead to new information on the blue whale movements and identify the links between different populations in these regions. These studies demonstrate the value of MMO data and present an excellent example of collaboration between industry and scientists resulting in extremely valuable contributions to the limited pool of information on these endangered whales.

Modelling cetacean habitat use in Norwegian waters

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In summer, Norwegian waters are a productive feeding ground for cetaceans. Fin, humpback, minke and sperm whale distributions are generally known but knowledge about the drivers of distribution at a large spatio-temporal scale is lacking. Here, habitat use of these species were investigated using data from the Norwegian Independent Line Transect Surveys (NILS) in June to August from 1995 to 2013. The relationships between abundance estimated along transects (taking detection probability into account) and a range of covariates were explored using Generalized Additive Models (GAMs). Candidate variables included depth and other relief variables, and satellite-derived data including monthly sea surface temperature. The distribution of all species was best explained by models including depth and sea surface temperature. Regarding depth, minke and humpback whales use was concentrated in shallower waters, the fin whale used waters around the 1000m isobaths and the sperm whale used depths greater than 1000m. The month for SST that best explained distribution was August for fin whale, July for humpback whale, June for minke whale and May for sperm whale. For all species, water with temperatures greater than 12°C were used less. The best models for Mysticeti species included time-lagged SST within the summer months but the best model for the sperm whale included SST in May, showing a more lagged relationship than baleen whales. In this area, the Mysticeti species feed on pelagic crustaceans (amphipods, krill) and fish (predominately capelin and herring), but the dominant prey of the sperm whale is squid (*Gonatus* spp). Thus, variation among species in the relationship with water temperature seems to reflect, in part, differences in the trophic level of their prey. Future work should include more covariates in modelled species-habitat relationships to increase understanding of the mechanisms that link the biological responses to the physical oceanography.

Modelling fine-scale distribution and density of harbour porpoises in the Southern Bight of the North Sea inferred from platform-of-opportunity data

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During the last 25 years, the harbour porpoise (*Phocoena phocoena*) has made a significant return in the southern portion of the North Sea and the English Channel. However, this species still faces multiple threats in the region, caused by important human activities, with serious implications for conservation and management. Using fine-scale data collected from platforms-of opportunity, we investigate the influence of environmental parameters upon the spatial and temporal distribution and density of harbour porpoises in the Southern Bight of the North Sea, between England and France. Ferry-based surveys were conducted year-round between November 2011 and June 2014. A total of 1,450 sightings were recorded during the study period. Inter-annual and monthly variations in mean group size were observed, with larger groups recorded in 2014 (mean = 2.02) and in January (mean = 2.32). Encounter rates and density of harbour porpoises also showed significant seasonal variation, with a peak recorded during winter months, as well as significantly increasing over the study period. There was a seasonally-dependent association with environmental variables (depth, bathymetric roughness and current speed), although the associations differed depending on whether group size or encounter rate were analysed. The results not only indicate changes in habitat use among seasons, but also differences in behaviour among habitats. Overall, our study reveals a continued increase in group size, encounter rates, and density of harbour porpoises in the southern North Sea, suggesting greater abundance of the species in this region, especially during winter. Information from this study should be incorporated into management plans for the

species, given that it faces relatively high levels of bycatch in this region.

Occurrence and abundance of delphinids in the Northern Aegean Sea from aerial surveys

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Monitoring wildlife population parameters over time and across space is pivotal to identify underlying drivers of changes and constitutes the backbone of evidence-based conservation. In this context, aerial distance sampling surveys have greatly contributed to inform management decision. This study provides the first assessment of the occurrence and abundance of cetaceans in shelf and coastal waters of the Thracian Sea from aerial surveys. Monitoring took place between June 27 and July 2, 2017. Two sets of transects, each with track-lines spaced 10 km apart, were designed using the Distance software and flown at a constant speed and altitude of 185 km/h and 198 m, respectively. Both design- and model-based approaches were used for the analyses. Four delphinid species, totalling 36 sightings, were recorded: 20 schools of bottlenose, 8 of striped, 2 of common and 1 of Risso's dolphins. In 5 instances the species remained unidentified. The paucity of sightings allowed abundance to be estimated for bottlenose dolphins and for dolphins as a group. Overall, the highest concentrations of delphinids occurred in the Eastern Thracian Sea with bottlenose dolphins recorded mainly over the continental shelf. Results from the model-based approach, having smaller CVs and smaller ranges for the 95% CI, were favoured over those from the design-based method. Accordingly, the uncorrected abundance was estimated at 449 (%CV= 35.60; 95%CI= 228-609) and 2,575 (%CV= 37.96; 95%CI= 1704-3083) animals for bottlenose dolphins and dolphins as a group, respectively. Although the small sample size, the results provide essential baseline reference for future monitoring such as the upcoming ACCOBAMS Survey Initiative. The monitored area presents high levels of detrimental interaction between marine mammals and human activity and therefore our data can help the identification of appropriate mitigation measures to anthropogenic threats, in particular within the WWF Kavala Fisheries Improvement Project.

Oceanographic drivers of sperm whale distributions off the west coast of Scotland

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Sperm whales, *Physeter macrocephalus*, are found in the deep off-shelf waters of the North Atlantic but little is known about the factors influencing their distribution. Elsewhere, sperm whales have been shown to be associated with oceanographic features that aggregate their squid prey. In this study we investigate the influence of topographically induced oceanographic currents on the distribution of sperm whales off the west coast of Scotland. Sperm whales were surveyed using a towed hydrophone array during the Extended Ellet Line (EEL) from the RRS Discovery in July 2016. Individual sperm whales were identified from their tracks, and the number of sperm whales were modelled in relation to topographic and oceanographic variables within quadratic Generalised Linear Models with Generalised Estimating Equations (GLM-GEEs) to account for temporal autocorrelation. Numerical models of the oceanographic currents around the two main sperm whale habitats were developed and compared with sperm whale locations. Sperm whales were associated with deep, high slope areas with higher SST. They were found in highest numbers around Anton Dohrn seamount and in the steep sided channel between Rockall Bank and George Bligh seamount. Both these areas were associated with very high oceanographic currents and internal waves likely to enhance productivity and aggregate their squid prey. Understanding the drivers of sperm whale habitat is important for informing conservation

management.

Possible conflict areas between harbour porpoises and floating debris in the German North and Baltic Seas

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The increasing amount of marine debris in the world's oceans raises concerns about the impacts on marine wildlife. For implementing directives, such as the EU Marine Strategy Framework Directive (MSFD), the identification of entry sources of marine debris, concentration areas and thus potential conflict areas is crucial for creating effective protective measures. For 15 years regular aerial line-transect surveys were conducted to gain information on the abundance and distribution of harbour porpoises (*Phocoena phocoena*) in the German North and Baltic Seas. During the aerial surveys information, such as GPS position and size, of the floating debris is additionally collected. In this study, all data on floating marine debris collected between 2002 and 2016 were analysed to identify spatio-temporal distributions. To judge potential conflicts for harbour porpoises the distribution of floating marine debris was then correlated with the data on harbour porpoise distribution. Results show distinct geographical and seasonal patterns of marine debris occurrence. These patterns overlap with seasonal harbour porpoise distribution, also within NATURA 2000 sites of community interest that are important habitats for harbour porpoises. Recorded debris included a high share of debris originating from fisheries, posing an increased risk for marine mammals, especially harbour porpoises. The contamination with marine debris possibly deteriorates the quality of habitats and conservation areas. We discuss potential impacts and reveal conflict areas in which immediate action has to be taken to reduce possible risks for marine mammals and to contribute to the implementation of the "Good environmental status" as requested by the MSFD.

Preliminary findings on the morphology of the peripheral nervous system of the external ear canal in odontocetes

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Cetacean mass strandings have been associated with exposure to high-energy anthropogenic noise, and the post-mortem investigations indicate pathologies related to such events. Although these kinds of exposure can trigger behavioural and physiological changes, the direct impact a low frequency and high intensity noise exposure can have on the physical tissues is still unclear, particularly regarding the acoustic pathways. Odontocetes can perceive sounds through their mandible and the associated acoustic fat bodies, which are in physical contact with the tympanic bulla and the ear bones. However, the exact pathway of how sound waves reach the inner ear is still under debate. Moreover, the involved tissues have been described in only few species, and as there are big interspecific differences in the acoustic spectrum, this constitutes interspecific morphological differences along the sound production and reception pathways. Furthermore, the function of associated tissues such as the external ear canal is unknown. Even if there is a general consensus amongst the scientific community that cetaceans could suffer from acoustic trauma after sound exposure, very scarce data is currently available to confirm this, especially during mass stranding events. Here, we will present the first stages of this project which involves the strategic partnerships between multiple international institutions involved in the assessment of the health status of vibration sensitive tissues in the head of small odontocetes. Furthermore, we will open up possibilities for more extended collaborations, and we will present preliminary results on the functional morphology of the peripheral nervous system related to the mentioned tissues.

Presence of microplastics in the digestive tract of stranded cetaceans from the Western Mediterranean

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Presence of waste at sea has been increasing over the last decades. As a consequence, microplastic presence at sea has also increased, due to both primary release of plastic particles, and degradation of larger plastic items. Microplastics easily enter the trophic chain due to their tiny size. They usually transport POPs (Persistent Organic Pollutants), but their toxic potential and ecotoxicological characteristics are still not fully understood. In the present study, we show the amount, size and colour of the microplastics found along the digestive tract of 41 stripped dolphins (*Stenella coeruleoalba*) and 1 Risso's dolphin (*Grampus griseus*) stranded at the coasts of the Valencian Community (East Spain) from 1989 to 2017. From the 42 analysed cetacean, 90.5% contained microplastics (37 *Stenella coeruleoalba* and 1 *Grampus griseus*), of which 73.6% were fibres and 26.4% were fragments. The predominant colour was black (50.1%), followed by red (21.2%), translucent (10.9%) and white (3.8%), among other less frequent colours. The individual with the highest amount of microplastics had 82 items. We saw that in the animals with higher numbers of microplastics, these tiny fragments were originated from fragmentation of macroplastics. This may indicate that microplastics enter in dolphins not only by trophic chains but also by direct intake of debris. The analysis of 10% of the samples by FT-IR (Fourier Transform Infrared Spectroscopy) showed the abundance of polyester (29%), polyacrylamide (25.8%), polyethylene (9.67%), alginic acid (6.45%) and other (6.4%). We conclude that, although being mainly pelagic[UdW1] animals, cetaceans are also exposed to waste and, specifically, to microplastics. Whether they intake them directly from the water column or from diet should be clarified in further studies. We should continue studying their presence and their associated toxicological effects so as to develop protocols of good practices and mitigation plans.

Seasonality in North Sea Marine Mammals using longitudinal ECMC partner data, 2006-2016

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Monitoring data on cetacean status is required to assess the effectiveness of legislation aimed at conserving and managing cetacean populations. The European Cetacean Monitoring Coalition (ECMC) was established to enable research groups in northwest Europe, to collaborate over monitoring status through surveys upon vessels of opportunity, i.e. freight and passenger ferries. The scale of recording effort by ECMC partners is substantial. This study focuses on data collected in the North Sea, chiefly by carrying out monthly surveys, using trained and experienced volunteer surveyors. Within this region, three ECMC partners operate, MARINElife, ORCA and Rugvin. The key objectives are (1) Collation of robust partner effort and sightings data from 2006-2016 in the North Sea; (2) Assessing exanct data for possible seasonal patterns in species distribution and relative abundance in the region; (3) Reviewing survey coverage and (4) Building on evidence for the effect of seasonality of different species and considering appropriate means of addressing this in further analysis of species abundance. In investigating seasonal patterns, the use of ferries as research platforms offers the advantages of survey routes operating over multiple years and all throughout the year. Data from this region comprised 467 surveys, from 20 routes and opportunistic surveys, covering 174,884km of survey effort from 2006-2016. 2,694 sightings were recorded across all years, comprising 5,412 animals. 12 species were positively identified and recorded. We discuss seasonal variability displayed by different species in this region, in both relative abundance and distribution, paying particular attention to Harbour porpoise and white-beaked dolphin, the two species recorded with highest frequency; and the importance of addressing this apparent seasonality in developing a means to analyse data in a regular and standardised way, in order to present information on species status and trends in an accurate and time effective way for reviewing conservation and management requirements.

Severe injuries as a conservation concern: evaluating the population-level effects of cryptic events on a coastal dolphin population

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Severe injuries in cetaceans resulting from human activities can generally (and statistically) be considered as "rare events". Such rare events occur with low frequency, but may have a potentially substantial impact on a population. However, despite being rare events, especially from an individual animal's perspective, when multiplied by the myriad of human activities that can injure a cetacean, the cumulative risk may become significant. Moreover, in relation to the amount of time researchers spend at sea (in relation to a cetacean's day, month, year, or lifetime), the likelihood of recording such events is also very low. Finally, the chance of these two rare events co-occurring (the injury occurring in the first place, and then, if it occurs, being recorded) is even smaller. Even bycatch, a known example of a rare event, is extremely difficult to estimate, even via well-designed monitoring programmes. All of this leads to severe injury events likely going unnoticed, but potentially having non-negligible consequences on populations. Still, even if recorded, it is difficult to ascertain their cause, and even more difficult to assess their impact on populations, especially if the animal is still alive when recorded. Consequently, such events are not typically included in population viability or status assessments, and their cumulative impact can be overlooked in assessing threats to populations. Based on a well-studied dolphin population as a case study, we use population abundance, incidence of severe injuries and estimates of detection rates in a framework to determine the impact of such events (and their underlying causes) on the population, and the feasibility of including this information in status assessments. Injury cases initially appeared rare, but accumulated with time. All were classified as either fishery or boat strike related. We show that cryptic events may have an unmeasured yet real impact on coastal cetaceans.

Sexual segregation in Antarctic fur seal pups, *Arctocephalus gazella*

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Sexual segregation is widespread in the animal kingdom, in which males and females can segregate in space, time and diet. Sexual segregation is apparent in many pinniped species in adult life, with the sexes segregating in foraging distributions, diving depths and diets. Common explanations for this segregation include the larger body size and higher energetic demands of males, as well as the constraints of parental care on females. However, sexual segregation is poorly understood in pinnipeds in early life. This study investigates sexual segregation in Antarctic fur seal pups. As part of a long-term monitoring programme, 300 randomly selected Antarctic fur seal pups were sexed within the beach and tussock grass areas at two sites on South Georgia, annually between 1989 and 2016. To investigate behavioural differences at an individual level, 19 male and 16 female pup were deployed with igot-U GPS data loggers at Bird Island, South Georgia. Their movements were tracked during the lactation period between December 2012 and April 2013. Image classification was conducted on an aerial image of Bird Island to determine habitat use by the pups. Results suggest sexual segregation in habitat use is apparent; males had a higher preference for the beach whereas females favoured the tussock grass. We postulate that this difference is due to contrasting drivers of pup behaviour. Male pups may prefer the more social area of the beach to play fight and gain social skills to ultimately compete for mates in later life, despite the increased dangers of injury and death from scavenging seabirds and larger seals on the beach. Females may prefer the relative safety of the surrounding tussock grass to minimize risk and increase their chances of survival. Exploring sexual segregation in additional pinniped species in early life could help underpin underlying drivers of sexual segregation in pinnipeds.

Tech4Whales: Towards Real-time, High Resolution Navigational Software for Whale Avoidance

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While underwater-noise-pollution is of growing concern for whales, another scourge has arisen in the last decades: ship strike which is now considered as the main threat to whales. As human populations continue to grow, the magnitude of collision events between ships and whales is projected to rise if no effective mitigation measure is implemented. Understanding, and then predicting, when, where and how ship strikes occur are not simple tasks but the variety of data sources to help answer those questions is growing. So are the technological advances and solutions and real time high resolution maps forecasting the risks of collision bear the potential for being the most effective mitigation tool yet to come. The Tech4Whales initiative seeks to dramatically improve the effectiveness of whale avoidance approaches by moving beyond ecological models to harness the full array of data and machine learning techniques. The driving idea is not to just create models of where strikes are likely to be, but to develop high resolution maps of probability of whale encounters in real time using all available data sources.

Through the sealing: Grey seal pup numbers increase in North Wales

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Grey seals in North Wales are amongst the least understood pinniped breeding populations in the UK due to the highly complex nature of the coastline and an absence of recent systematic monitoring, particularly regarding pup production and distribution of pupping sites. The last full census of grey seal pups in North Wales was in 2004. To establish more recent estimates of pup production and identify new pupping sites along the coastline, we undertook a full ground-based census between Aberystwyth and the Dee Estuary in the Autumn of 2017. We sampled all active and newly identified potential pupping sites in 7-10 day cycles by boat, sea kayak and on foot and utilised ongoing partnerships with local stakeholders including local wildlife trusts and members of the general public to assist data collection where possible. On some accessible and open pupping sites we used drones to count pups – a novel monitoring technique that complemented traditional methods. No less than 200 live pups were recorded across approximately 70 active pupping sites throughout the season. Results suggest a minimum increase in pup production of 100% and a 50% increase in the number of pupping sites in comparison to the 2004 census. These values correlate well with a consensus of substantial increases in grey seal abundances along the west and south-west coast of Wales and across the UK. This focused and collaborative survey made for a robust and systematic sampling approach throughout the pupping season. It has generated a significant dataset that will increase conservation awareness in local stakeholders, as well as provide robust advice to the Welsh Government and regulators to support decisions on the Conservation Status of grey seals in Welsh waters.

Towards the identification of 'Units for Conservation' for bottlenose dolphin *Tursiops truncatus* (Delphinidae, Cetacea) in European waters

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Geographic discontinuities in the distribution of a species is a cardinal issue in ecology, with important implications for conservation and management. The recognition of locally adapted populations is especially important for cosmopolitan species like the bottlenose dolphin *Tursiops truncatus*, as it can provide evidence that may help define Management Units and Evolutionary Significant Units in need of special conservation efforts. We aimed at identifying

such units by examining the shape and size variation of European bottlenose dolphin populations by means of two-dimensional Geometric Morphometrics of the skull and mandibles, including in marine areas for which genetic data are lacking. A total of 68 landmarks were recorded on 268 skulls from eight marine areas in the Mediterranean Sea, in the Atlantic Ocean and in the North and Baltic Seas. Results clearly showed a separation between Mediterranean and extra-Mediterranean samples. Moreover, five distinct morphotypes were identified in European waters: three in the Mediterranean Sea (Adriatic, Levantine and west Mediterranean) and two in the Atlantic Ocean (central North Atlantic and North/Baltic). Differences among types also included measures of static allometry. A fine-scale structure of morphological population was found in the eastern Mediterranean, while in western Mediterranean was found a unique dispersal population. Skull traits responsible for the variation mainly involved the braincase and the mandible. The pattern of geographic variation was compatible with three geographic boundaries: the Sicily strait, the Gibraltar strait and the English Channel. Although the bottlenose dolphin is very widespread species and is not considered to be threatened, it is also necessary to conserve the morphological populations that are adapted to the local environmental conditions.

Toxoplasmosis and Herpesvirus in common bottlenose dolphins (*Tursiops truncatus*); a first report from the Eastern Mediterranean Sea

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Toxoplasmosis is a disease caused by a coccidian protozoan (*Toxoplasma gondii*) that infects a wide range of homeothermic organisms including marine mammals, though it can only undergo sexual reproduction in its definitive host, the cat. The parasite is transmitted to other animals through ingestion of oocysts that are released to the environment in the cat's faecal matter and through consumption of infected tissue; the mechanisms of transmission to dolphins are unclear as their diets do not consist of 'warm-blooded' animals and they drink little or no water. Reported in this study is the diagnosis of toxoplasmosis in three common bottlenose dolphins (*Tursiops truncatus*), including one case of coinfection with herpesvirus. All animals were found stranded on the Mediterranean coast of Israel in May and November 2013. In one of the three cases, the dolphin was found alive and submitted for intensive care. Nevertheless, the animal died after five days of attempted rehabilitation. Full necropsies were performed on all specimens as well as ancillary examinations; Toxoplasmosis was confirmed to have been the etiologic agent in at least one of the three animals. The findings of this study may suggest a focal event of pollution from coastal sewage or ship runoff waters that have triggered the disease's outbreak or, alternatively, general immunosuppression of the local population. The prevalence of *T. gondii* infection in Mediterranean cetaceans is largely unknown, yet several clinical cases exist from the western basin of this region. To our knowledge, this is the first report of *T. gondii* infection of marine mammals in the Eastern Mediterranean Sea. Considering implications of this study to ecosystem and public health, it is of both scientific and societal relevance.

Tracing the origins of the modern Mediterranean baleen whale fauna: hints from the fossil record

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The current cetacean fauna of the Mediterranean Sea substantially represents a sub-set of the North Atlantic one. In

particular, a single mysticete species (the fin whale *Balaenoptera physalus*) is commonly observed in the Mediterranean Sea, where it forms a well-distinct residential sub-population, whereas a few other forms of baleen whales are known from the same basin only for a small number of occasional and often dubious sightings. On the contrary, the Italian record of fossil mysticetes from the Pliocene epoch (ca. 5.3–2.6 millions of years ago) depicts a strongly different scenario, characterized by a great number of species, belonging to at least three families (Balaenidae, Balaenopteridae, and Eschrichtiidae), exploring a wide spectrum of body sizes and ecotrophic habits. The transition from the highly diversified Pliocene Mediterranean mysticete assemblage to the strongly simplified modern fauna has been substantially unexplored for a long time, mainly because of the scarcity of fossil-bearing marine deposits of Quaternary age (from ca. 2.6 millions of years ago onward), a time span which features the final establishment of permanent glacial conditions at the high latitudes of the Northern Hemisphere and consequent low mean values of sea level. Now however, investigations focusing on the few Quaternary fossil specimens of baleen whales and on the more abundant fossil record of whale barnacles (*Coronula* and allied forms) are highlighting a surprisingly complex Quaternary history for the Mediterranean mysticetes, featuring time intervals characterized by the occurrence of balaenid and balaenopterid communal breeding grounds, as well as periods in which the pygmy right whale *Caperea* occurred in the waters off South Italy. Here we present a synthesis of the ongoing research on the Quaternary history of Mediterranean baleen whales and try to trace the origin of the current monotypic Mediterranean mysticete fauna in the light of major climatic, biooceanographic, and evolutionary trends.

Whales in a rubbish sea - a regional cooperative project to help monitoring litter impact on cetaceans in the Mediterranean Sea

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Nowadays marine litter heavily affects the marine environment, especially in the semi enclosed Mediterranean basin. Marine mammals are amongst the most threatened indicative species. To prioritize marine conservation measures, data are needed to analyse litter impact on marine fauna and highlight the dynamic overlap between pressures and the primary biological needs of species. However, effective monitoring requires consistency over time and huge sample sizes to overcome the very large spatial and temporal heterogeneity in litter and species distribution. The MEDSEALITTER project is focusing on the development of effective methodologies to monitor the potential impact of macro litter on megafauna (marine mammals, sea turtles). The partnership of the project brings together environmental agencies, scientific organizations, Marine Protected Areas and NGOs in order to set a baseline to assess litter abundance, distribution and impact necessary to evaluate effective conservation measures. Different experiments were carried out to define the most appropriate protocols for monitoring litter impact at the basin and local MPAs scales through regional cooperation. Synoptic monitoring of macro-litter and macro-fauna were conducted from different platforms (ships as ferry, sailing vessel and small vessel, aircrafts, drones) and the effect of potential covariates were analysed in order to set the protocol parameters: type of platform (height / speed), experience of observers, visibility condition, strip width, lower size limit of items, size and color of items, eye versus camera, etc. Obtained data on litter distribution were related to marine mammals' locations in order to target risky areas at sea. Diet analyses and the collection of ingested debris also support a better understanding of litter impact on marine fauna. Results are used both for the direct management of the MPAs involved in the project and to support the establishment of standardized conservation procedures at large basin scale.

Where are the Risso's dolphins (*Grampus griseus*) of the North Western Mediterranean

Sea? Study of Movements Within and Outside the Pelagos Sanctuary

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The population of Risso's dolphins frequenting the Pelagos Sanctuary in the Mediterranean Sea has been monitored by Tethys since 1990 and also by other institutions subsequently. Previous studies found that since 2008 the encounter rate of this species in the Tethys' study area declined dramatically. No sightings were reported in the Italian portion of the sanctuary from June 2014 to August 2017. In order to understand the causes of this decline the movements of Risso's dolphins were analysed by comparing photo-identification data collected within and outside the sanctuary. Tethys collaborated with CIMA sharing data collected between 1990 and 2014. Collectively they surveyed an area of circa 30,000 km2 and recorded 132 and 31 sightings of Risso's dolphins respectively. Combining Tethys' and CIMA's catalogues resulted in 402 individuals being identified. 60.7% were sighted only once or twice suggesting an occasional presence in the study area while 29.4% were sighted in 5 or more years showing relatively high site fidelity. 28 individuals were considered resident with 12 or more sightings across different years. The mean distance between consecutive sightings was less than 35 km and only 5% were more than 100 km apart, suggesting a tendency to utilise a small area most of the time and to only occasionally travel further. Most sightings were between 600 and 1200 m depth. Other collaborations were also established, so far resulting in individuals from the Tethys' catalogue being matched with a sighting off the north-eastern coast of Sardinia (Italy) and another along the Catalan coast (Spain). These represent record linear distances of 312.6 km and 493.8 km respectively, the latter exceeding the sanctuary's boundaries. These results show how data sharing enables a better understanding of the ranging patterns of this species which is critical for developing effective conservation strategies.

ABSTRACTS – POSTERS

AN ACOUSTIC & NOISE

AN01 Echos of tropical Humpback whale song in North Norwegian waters

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Since 2012, Humpback whales have appeared in numbers in the waters of the fjords near the town of Tromsø (Norway). Between these whales, Humpbacks belonging to the breeding population of the Cape Verde Islands have been photo-identified. As it is known that the males of Humpback whales of a same population share the same song, and that they can intermittently sing in northern feeding grounds, in November 2014 and January 2015 attempts were made to make recordings from different platforms (boat, pier), with a handheld hydrophone and a digital recorder. Sounds comparable to song elements were indeed recorded during both periods. A first comparison is made with a song recorded in the 2015 Cape Verde breeding grounds, showing similarities and differences on the level of syllables, phrases, and themes.

AN02 Vocal repertoire of mammal-eating killer whales in Russian Far East seas

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Killer whales in the Northwest Pacific are represented by two distinct ecotypes: fish-eating (sometimes called "resident") and mammal-eating ("transient") groups. The vocal behavior of fish-eating killer whales in the Northwest Pacific (Kamchatka, Avacha Gulf) has been studied in detail, but little is known about acoustic communication in mammal-eaters. Fish-eating killer whales are highly vocal species and their community possesses pod-specific dialects, which are transmitted from generation to generation through social learning. Mammal-eating killer whales are silent most of the time and difficult to observe. Their vocal behavior appears to be constrained by the hearing abilities of thier prey; they vocalize during social activity or after marine-mammal kills. Here we present a summary of the acoustic data collected during encounters of mammal-eating killer whales in 2015-2017 in Avacha Gulf, Kamchatka and the Western Okhotsk Sea. We address the question: do mammal-eaters from eastern Kamchatka possess a vocal repertoire distinct from that of the Western Okhotsk Sea mammal-eaters? We describe the vocal repertoire of these Okhotsk Sea mammal-eating killer whales, compare it with that of Avacha Gulf mammal-eaters and compare call frequency contours using a dynamic time-warping algorithm. The repertoire and call-usage patterns of the mammal-eating killer whales from Avacha Gulf and the Western Okhotsk Sea showed some differences suggesting that these communities are at least partially isolated. This is also important because the preliminary estimated population size of the Okhotsk Sea mammal-eaters is only a few hundred individuals, yet quotas for live-captures are issued annually for this presumably small community. Our study suggests that they are separated not only from fish-eating killer whales of the Okhotsk Sea (which has been shown before), but also from the small Kamchatkan mammal-eating community.

AN03 Do beaked whales click differently in shallow waters? Characteristics of on-axis clicks of Mesoplodon bidens recorded in the Baltic Sea

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Hardly anything is known about the echolocation behaviour and characteristics of Sowerby's beaked whales (Mesoplodon bidens). Since those animals mainly range in open waters of several hundred meters depth, their occurrence in shallow waters in small bays is often fatal. In September 2015 a Sowerby's beaked whale live stranded in Wohlenberger Wiek in the German Baltic Sea. The animal was refloated but it was uncertain whether it can survive the stress and will find its way back to the open ocean. We tested whether we can record echolocation clicks of this deep diving species in shallow waters of around 3-10 m depths. Echolocation clicks of the animal were actually recorded with a six element hydrophone array with a spacing of 50 cm and total aperture of 2.5 m. The analysis of several on-axis clicks in proximity under 15 m to the array regarding frequency characteristics led to a multimodal frequency spectrum. Different peak frequencies between 20 kHz and 90 kHz were observed, the -3 dB and -10 dB bandwidths were calculated to be 32 kHz and 48 kHz. The results show an overall peak frequency of 80 kHz and a click duration of 28 µs. The animal showed typical odontocete scanning behaviour and variability in inter-click interval as well. While these data do not represent typical

echolocation behaviour of beaked whales, they add to the growing body of knowledge of their echolocation behaviour. Even though echolocation clicks were recorded, the animal stranded four weeks later in Sweden with an empty stomach and heavy ulcerations indicating that it did not feed on abundant garfish, cod and herring in the Baltic Sea.

AN04 Acoustic occurrence detection of a newly recorded Indo-Pacific humpback dolphin population in waters southwest of Hainan Island, China

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In 2014, Indo-Pacific humpback dolphins were recorded for the first time in waters southwest of Hainan Island, China. In this paper, their temporal occurrence in this region was detected by stationary passive acoustic monitoring. During the 130-day observation period (from January to July, 2016), 1969 click trains produced by Indo-Pacific humpback dolphins were identified, and 262 ten-minute recording bins contained echolocation click trains of dolphins, of which 70.9% were at night and 29.1% were during the day. A diurnal rhythm with a nighttime peak in acoustic detections was found. Passive acoustic detections indicated that the Indo-Pacific humpback dolphins frequently occurred in this area and were detected mainly at night. This information may be relevant to conservation efforts on these dolphins in the near future.

AN05 Comparing acoustic monitoring devices for odontocetes - First step: The acoustic performance in the field

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As the Baltic Sea harbour porpoise (Phocoena phocoena) is critically endangered, it is necessary to study its spatial distribution and seasonal occurrence to define marine protected areas. Experience has shown that the most suitable method for low density areas is acoustic monitoring using click detectors. The T-POD and its successor, the C-POD, are the acoustic monitoring devices that are commonly used. Other acoustic monitoring devices are also available, although less commonly deployed, namely the A-Tag (fixed stereo passive acoustic monitoring system) and the PCL (porpoise click logger); both have been used to conduct different studies. We determined the acoustic detection functions of the four acoustic monitoring devices by playing synthetic porpoise-like clicks at varying source levels and distances from 0 to 500 m. The maximum detection distances ranged from 62 m for the A-Tag (n=2), 91 m for the PCL (n=2), 174 m for the T-POD (n=3) to 258 m for the C-POD (n=7). In addition we investigated the user friendliness, the recorded parameters and the post processing of the recorded parameters and other factors of the different acoustic monitoring devices. Considering all aspects, the C-POD is the most suitable click detector for acoustic long term monitoring in low density areas. However, the individual advantages of the other acoustic monitoring devices should be taken into consideration while planning future monitoring projects.

AN06 Using passive acoustic to assess humpback whale occurence and breeding activity around Reunion Island

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Humpback whales use coastal waters of La Reunion Island seasonally from June to October. Their distribution is relatively well-known on the west coast, which provides suitable breeding habitat, however little is known about the use and movement along the south and east coast of the island. Three autonomous acoustic recorders were deployed during the 2016 and 2017 breeding seasons off the west, south and east coast to investigate spatial and temporal variations in humpback whale occurrence around the island. Sound Trap acoustic recorders were duty-cycled to record 10 min every hour for 4 months, from July to October 2016-2017. Social sounds and songs were discriminated and quantified, by computing, for each 10 min recording session, the total duration of each vocalization event. The results confirmed a higher use of the west coast and an increase occurrence of humpback whales in 2017. A peak of breeding activity (song) was observed in the middle of the breeding season, starting from late July until late August, off the west, south and east coast, and up until the end of September off the west coast in 2017. Daily variations in singing activity were observed off the west coast in 2016: singers appeared to be more active at night and during the morning. The daily pattern vary faint in 2017, when whale occurrence was high. These results suggest that males may use different breeding strategy depending on whale density on the breeding site. In year of low occurrence, it might be more advantageous for a male to sing at night and switch to direct competition for females during daylight. When density is high, the proportion of males singing during the day might increase, as a result of an increase competition among males.

AN07 Modelling the effect of air gun array noise on marine mammal communication

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Seismic airguns used in scientific surveys in the Southern Ocean produce high-intensity impulsive sounds with most energy concentrated in the low frequency band. This frequency range overlaps with many marine mammal vocalizations, especially the songs and calls of baleen whales. Even at large distances from the source, airgun noise may therefore interfere with marine mammal communication. In order to assess the masking effect of airgun noise we first studied the propagation of airgun signals in the Southern Ocean. A parabolic equation approximation was used to model sound propagation. The propagation models were verified based on recordings and metadata for two seismic surveys in the Southern Ocean. Numerical predictions are consistent with the measurement results within a few dBs for the sound exposure and energy spectral levels. Subsequently we studied the ability of a listening animal to detect vocalisations of a conspecific in the absence and presence of propagated airgun noise. The auditory detection process was modelled using spectrogram correlation.

AN08 A pulsed-air model of blue whale B calls: Implications for observed long-term decreases in call frequency
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Studies of blue and fin whale calls have shown a lowering of call frequencies over long (decadal) time scales. Increasing population size and/or increases in ambient noise have been postulated as possible explanations for the decrease. Recently, Dziak et al. (2017) presented a sound production mechanism where the fundamental and overtone frequencies of blue whale B calls can be well modeled using a series of short-duration (< 1 s) wavelets. The likely source of these wavelets are pneumatic pulses caused by opening and closing of respiratory valves during air recirculation. This vocal production model is similar to those proposed for humpback whales, where valve open/closure and vocal fold oscillation is passively driven by airflow between the lungs and upper respiratory spaces. This model also implies that call frequencies could be actively changed by the animal to center fundamental tones at different frequency bands during the call series. It is thought that it is energetically more expensive for whales to call at a lower frequency. This pulsed-air model implies that a simple increase in time spacing between air pulses can cause a decrease in the fundamental frequency. This may mean a lower exhalation rate (slower reduction of lung volume), where variation in hydrostatic pressure due to changing water depth of the animal could also play a role. This pulsed-air model also implies there is no low frequency floor to blue whale calls. However, there are practical considerations that likely limit the low end, for example shallow water (<50 m) will limit the frequencies that can propagates efficiently to >30 Hz. Also NE Pacific blue whales have B calls with typical call durations of ~7 seconds, which implies the lowest frequency possible is two pulses over 7 seconds, which yields a frequency of ~0.125 Hz.

AN09 The acoustic repertoire of free-ranging bottlenose dolphins ***(Tursiops truncatus)*** **in southwest Abaco, Bahamas**
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The types and characteristics of sounds produced by free-ranging bottlenose dolphins (Tursiops truncatus) have been found to vary across geographic regions. It is therefore critical to identify specific regional vocal repertoires as the basis for future studies investigating signal functionality, the further development of passive acoustic monitoring techniques and to assess the potential impact of anthropogenic noise. This study describes the acoustic repertoire of free-ranging bottlenose dolphins in southwest Abaco, Bahamas. Acoustic recordings from a static hydrophone were collected during the summer months from 2008 to 2015, whereas recordings from a handheld hydrophone were made during the summer of 2015 and March 2016. Recordings from 16 encounters, a total of 2 hours and 53 minutes, were analysed. The analysis focused on the identification and characterisation of five sound types: whistles, chirps, low-frequency narrow-band (LFN) sounds, brays and other burst pulse (BP) sounds. Whistles ranged from 2.6 to 26.4 kHz in frequency. When compared to 13 other geographic regions, whistles in the Bahamas had the highest end frequency. The duration was much shorter and the number of inflection points much lower than in any other population. Start, minimum and maximum frequency were within the same range when compared to 13 other geographic regions. Chirps with a good signal to noise ratio were only identified in 3 out of 16 encounters. BP sounds had a mean duration of 0.15 seconds and were generated at 214 - 853 pulses per second. LFN sounds and brays could not be found in our sample. The bottlenose

dolphins' acoustic repertoire clearly shows geographic variation in types and characteristics of sounds. Describing these differences will help future studies on the possible reasons for this variation.

AN10 Effects Of Vessel Noise On Underwater Vocalizations Of Bottlenose Dolphins, Tursiops Truncatus, In The Sado Estuary, Portugal

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Maritime traffic is an important source of disturbance for coastal cetaceans, especially for local populations, like the bottlenose dolphins (Tursiops truncatus) in the Sado estuary. To compensate masking effects from vessel noise, animals might change their vocal behavior by shifting vocal rate, call frequency and/or duration. To evaluate the potential impacts on the acoustic behavior of this population, abundance and acoustic characteristics of whistles, echolocation signals and burst-pulsed sounds were analyzed in relation to boat traffic. The samples used were obtained in field recordings of dolphin vocalizations made from March 2014 to April 2017. Boat traffic operating within a 1000 m radius was registered as absent or present. Vocal elements were classified according to visual graphical and aural characteristics as whistles, slow-click trains, short-burst pulses, creaks, squawks, variable rate click trains, bangs, gulps, squeaks and grunts. Analysis of emission rates was based on the number of recognizable units per minute for all vocal elements. In the presence of vessels, differences in call rates were not significant for all types of vocal elements. For selected vocal elements, different acoustic parameters were examined, using a nonparametric MANOVA, and significant differences were found for the following vocal elements: whistles ($p < 0.001$), creaks ($p = 0.012$), grunts ($p < 0.001$), gulps ($p < 0.001$) and squeaks ($p = 0.004$)). These results reveal shifts in acoustic behavior in the presence of vessels, suggesting that bottlenose dolphins in this population might adjust their vocal frequencies and produce shorter signals to maintain communication. This study shows that although resident bottlenose dolphins in Sado estuary seem to display some tolerance to the noise generated from boats in their habitat, it probably causes significant changes in their communication behaviors.

AN11 Year-round acoustic activity of bottlenose dolphins in a high impacted coastal area of the Central Mediterranean Sea

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The Sicily Channel is one of the most impacted areas of the Mediterranean Sea by fishing activity and shipping traffic. As part of a long-term program for monitoring anthropogenic impact on marine species, we acoustically evaluated the year-round presence and activity of bottlenose dolphins, and their overlap with noise and boat occurrence. A sensor was deployed on an elastic beacon at three miles from the coast, in the North Western side, where the Channel creates a bottleneck. Recordings, collected continuously for 14 months, from January 2015, were automatically processed for analysing daily and seasonal variations in dolphin's vocal activity. A regular year-round occurrence along the months and a clear diel pattern were shown. Vocal activity was lower during light hours and higher during the night, and presented an increase from March to August, an abrupt decrease in September and a peak again in November. The analysis of click types and whistles indicated that the area is used both for feeding and socializing, with seasonal variation. To estimate anthropogenic impact, we evaluated the number of boats passing within 3 miles from the recorder, through the Automatic Identification System (AIS), and calculated Sound Pressure Levels (SPL) at 63, 125 and 250 Hz frequency bands. Results showed a strong negative correlation with noise levels and a complex interaction with the different components of nautical traffic.

AN12 Submarine Multidisciplinary Observatory "SMO-OnDE": a real-time acoustic system for the monitoring of cetaceans and anthropogenic noise in the Ionian Sea

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SMO-OnDE is a cabled deep-sea acoustic observatory operating in the Gulf of Catania (Ionian Sea), at a depth of 2100 m, since February 2017. SMO-OnDE allows the continuous monitoring of biological, anthropogenic, geophysical and weather driven acoustic sources in the Ionian Sea. The observatory consists of a frame connected to a shore lab via a 28 km long electro-optical cable and equipped with four synchronized broadband hydrophones, displaced in a tetrahedral configuration. Acoustic data are continuously acquired at a sampling rate of 192 kHz/24 bit, digitized close to the sensors and then sent via optical fibers to the shore servers. The hydrophones' sensitivity is -175 dB re 1uPa/V flat in the band between few Hz and 80 kHz. Such a system generates a very large amount of data at high sampling rate, requiring big storage and extensive analysis time and effort. In accordance with previous studies performed in the area, a new data acquisition and analysis system was developed. Custom algorithms allow on-line search and analysis of specific cetacean sounds (sperm whales and fin whales) ship noise and airguns. Triggered signals are recorded together with information on (average, maximum and nth percentiles) of pressure density function of the acoustic noise every 5'. The developed acoustic analysis system archives only data sections containing useful acoustic data (defined by users' rules) allowing a continuous monitoring with significantly reduced storage and analysis requirements compared with previous acquisition and analysis systems such as the NEMO-OnDE experiment (2005-06). SMO-OnDE is expected to extend the long-term studies on cetacean population dynamics and noise trends in the Ionian Sea. The discussed results represent a relevant outcome of a strategic partnership between physicists, biologists and ecologists that has been going on for more than ten years.

AN14 Measuring the size of Mediterranean sperm whales through the inter-pulse interval: comparative study of the total body length formulas

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*Sperm whales (Physeter macrocephalus) emit clicks composed by multiple pu*lses. The inter-pulse interval (IPI) is the time interval between two consecutive pulses. Representing the two-way time for a pulse to travel the spermaceti, the IPI is a proxy of head length, thus is widely used to estimate the total body length. By estimating the size distribution of sperm whales, the population structure can be studied, that is fundamental to conservation and management purposes. The aim of this study is to investigate the body length of sperm whales through IPI (ms) calculus of "usual-clicks" and "codas". The recordings were collected during 2015 inside the Pelagos Sanctuary for cetacean protection (Mediterranean Sea). Four different formulas (Clarke, Gordon, Growcott and Rhinelander & Dawson) were applied to calculate the body length and the results were compared. During nine sperm whale encounters, 10h23min of recordings have been collected. Eight hundred and eighteen usual-clicks and twenty codas were used for IPI measurement. The IPIs results ranged from a minimum value of 2.5 ms to a maximum of 5.0 ms. According to the formulas used, the smallest sperm whale was 8.5 m length, while the biggest was 12 m. By applying the Rice's curve of growth the majority of sperm whales resulted between 9 and 12 meters, corresponding to adult female or juvenile male, while only one immature male or female (< 9 m) and only one adult male (> 12 m) were recorded. The knowledge of body length acquires particular importance for Mediterranean sperm whale being sensitive to noise pollution, highly vulnerable to ship strikes and classified as endangered by the IUCN Red List. This study has been conducted in the framework of the project WHALESAFE, funded by the Life+Nature programme 2013, which aims to improve the conservation status of sperm whale**.**

AN16 From the evaluation of the anthropogenic pressure of underwater noise to the impact assessment: French approach of the MSFD

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The Marine Strategy Framework Directive (MSFD) is an ambitious policy that aims to protect more effectively the marine environment across Europe. Members States have to assess the Environmental Status of their waters regarding eleven descriptors of state, impacts, and pressures. In particular, MSFD is one of the first international policies to acknowledge the anthropogenic pressure of the underwater noise through the evaluation of the descriptor 11 (D11). The hazard of underwater noise pollution is divided in two criteria: D11C1 for impulsive sources and D11C2 for continuous sources. This presentation introduces the assessment of the D11 for the French waters regarding these two criteria. The approach relies on the impacts of the noise on marine mammals that has been the most documented by the research activities over the past decades. Thus, the D11C1 is related to risks of short-term disturbance, including injuries and even death at individual level whereas the D11C2 is related to the risk of disturbance at population level with regard to communications masking or inducing changes of distribution areas, for instance. The objective of the assessment is two-fold: the first one is to provide relevant pressure indicators of D11C1 to enable a suitable management of the underwater noise; the second one is to use appropriate indicators as input of the marine mammal state descriptor (Descriptor 1, D1) to assess the impacts of underwater noise. This presentation focusses on the definition of the pressure indicators for D11C1 and D11C2 in term of spatial and temporal extents. The methodology proposed for combining noise pollution (D11) and marine mammal distribution (D1) is presented and the first results of impact assessment are discussed.

AN17 Marine noise budgets in practice

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Many countries have made statutory commitments to ensure that underwater noise pollution is at levels which do not harm marine ecosystems. Nevertheless, coordinated action to manage cumulative noise levels is lacking, despite broad recognition of the risks to ecosystem health. We attribute this impasse to a lack of quantitative management targets – or 'noise budgets' – which regulatory decision-makers can work towards, and propose a framework of risk-based noise exposure indicators which make such targets possible. These indicators employ novel noise exposure curves to quantify the proportion of a population or habitat exposed, and the associated exposure duration. This methodology facilitates both place-based and ecosystem-based approaches, enabling the integration of noise management into marine spatial planning, risk assessment of population-level consequences, and cumulative effects assessment. Using data from the first international assessment of impulsive noise activity, we apply this approach to harbor porpoise in the North Sea.

AN18 Limited Combinations of Multiple Sound Units Indicate Non-Random Use of Call Combinations in Norwegian Killer Whale *(Orcinus Orca)* Vocal Repertoires

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Killer whales rely upon vocal communication for social interactions. Although their vocalizations have traditionally been classified into discrete call types, an alternative view in animal communication suggests that some species may construct vocalizations by systematically combining segments, or 'units', from a defined repertoire. It was shown that Norwegian killer whales combine discrete calls to produce 'compound-calls'. However, taking into account the number of combinations that could be generated, a relatively low number of these compound-calls were ever recorded. In this study we aimed to measure the randomness of the sequencing process of killer whale vocalizations to test the hypotheses that vocalizations are generated by sequencing specific discrete segments in a systematic way. For this, we recorded a single Norwegian wild-born killer whale in captivity, where all vocalizations could be unmistakeably assigned to that individual. We measured the underlying constraints of the vocal arrangements using Kullback-Leibler divergence (relative entropy) and Zipf's distribution. The individual produced a repertoire of 22 units, which it used alone or recombined. 94% of the discrete vocalizations were composed by one or two units. This corresponded to 97 different discrete vocalizations, from a total of 484 that could have been generated from all possible one and two unit combinations. The results of the Kullback-Leibler divergence (0.71 bits, considerably lower than the maximum randomness estimate of 4.46 bits) and the slope of the Zipf's correlation (-2, lower than both a 0 slope for randomly generated dataset and -1 for most human languages) showed that the order in which the units are organized to produce vocalizations is non-random. We concluded that there were constraints in the way this individual arranged and produced vocal units, and suggest that similar constraints may drive the way some killer whale populations string elements together into complex vocalizations.

AN19 A long-range, high accuracy passive acoustic system for motorboat detection, tracking and classification in sensible areas

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Detecting surface ships is a necessity in many sensible areas, such as Marine Protected Areas (MPA) and harbours. A Passive Acoustic Monitoring (PAM) system could be an effective alternative to the usual monitoring systems, as radar or active sonar, for localizing unauthorized ship activity, without revealing its presence. In the framework of EU project ARION, that aims to improve the conservation status of bottlenose dolphins, a real-time algorithm for detecting, tracking and classifying single motor boats was developed, using the acoustic data recorded by its PAM system. Two autonomous permanent marine buoys were installed close to the MPA of Portofino (Italy); each buoy is equipped with a hydrophone array, whose raw data are send via Wi-Fi to a ground station where real-time analysis is performed. Three separate algorithms were developed: a detection algorithm, based on Time Difference Of Arrival (TDOA) measurements, a tracking algorithm, based on a Kalman filter, a classification algorithm, based on the DEMON method. The detection algorithm succeeded in evaluating the bearing angle of a target, with respect to each buoy, with an uncertainty of 2 degrees and a maximum range of 2.5 km. The source position was then obtained with a triangulation method. The tracking algorithm was first tested with dedicated simulations and then commissioned with real cases of ships detected by the ARION system. The algorithm succeeded in rejecting fake signals, reconstructing the real vessel courses and estimating the speed with an accuracy of 20 %. The classification algorithm aimed to extract the acoustic signature of a ship, as feature to identify it. The algorithm succeeded in isolating the acoustic signature of single vessels, demonstrating its temporal stability and the consistency of both buoys results. The classification algorithm is ready for multi-target detection, that will be developed as future upgrade of the ARION analysis system.

AN20 Structure and function of female and pup contact calls in southern elephant seals (Mirounga leonina)

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Vocal recognition plays a crucial role in maintaining the mother–pup bond during the period of offspring dependence in most mammal species, and recognition requires individuality of signals. Many pinniped species are highly gregarious, and breed in large and dense colonies. Aggression towards pups can be frequent, and separation of the pup from the mother can be common. Therefore, an efficient mother-pup recognition system is essential for the survival of the pup. Southern elephant seals (Mirounga leonina; SES hereafter) breed in large harems, and, therefore, should have a well developed communication system to maintain the mother-pup bond during the suckling period. We studied individuality of contact calls of female and pup of SES at Sea Lion Island (Falklands Islands), during the 2014 breeding season. We recorded and analysed 104 calls of 29 females and 252 calls of 40 pups (at least 3 recordings per individual). We measured time, frequency and intensity parameters of calls, we classified calls based on their structural characteristics, and we calculated indices of individuality (repeatability and potential for individual coding). We showed that female calls were mainly tonal with a rich harmonic structure, while pup calls often had harsh, non harmonic, parts. Moreover, pups frequently showed non-linear acoustic phenomena, possibly related to stressful situations. Females emitted longer calls at lower frequencies than pups, as expected from their larger size. Frequency parameters measured on the harmonic part of the calls presented the highest level of individuality and repeatability compared to time and structure parameters, and, therefore, are the most likely candidates for individual recognition. All together, these results indicated that SES female and pup calls encode an individual signature that might allow individual recognition, although apparently not as strong as has been reported previously for other species of pinnipeds.

AN21 PAM studies from offshore Irish water collected during the Cetaceans on the Frontier Surveys 2009-2014

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Cetaceans on the Frontier (COTF,1-7) was an annual dedicated cetacean survey, carried out in Irish offshore waters from 2009 to 2014. The survey was coordinated by the Galway–Mayo Institute of Technology and the Irish Whale and Dolphin Group and included a number of national and international partners. It is funded under the Marine Institutes' competitive ship-time scheme, through the Marine Research Sub-programme of the National Development Plan. COTF surveys combine multidisciplinary techniques that allow for a better assessment and monitoring of the Irish offshore cetacean species, together with the collection of birds, megafauna, plankton, microplastics and oceanographic data. One of the most important objectives of this project is to conduct a habitat focused acoustic survey of cetacean distribution and relative abundance in key habitats for all species using a high frequency acquisition system (towed hydrophone array) at the continental Irish shelf edge. More than €1 million of funding has been received for this programme, allowing for the collection of over 500 hours of Passive Acoustic Monitoring (PAM) data as well as visual observations of more than 350 hours, including above 400 sightings. Acoustic monitoring can detect cetaceans which are beyond the visual observers view and therefore increase the capacity of a survey. The objective of this study was to analyse the acoustic data recorded during this project in order to characterise the presence and the distribution of the different species of cetaceans on this area. Habitat modelling provided interesting insights the distribution of cetaceans in relation to environmental variables and habitat use which will lead to robust recommendations to better inform management of offshore Irish waters.

AN22 Click around the clock: diurnal clicking pattern of captive harbour porpoises

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Harbour porpoises (Phocoena phocoena) use clicks i.a. as a means of finding food, navigation and communication. There is a growing evidence for a strong diurnal pattern in harbour porpoise vocal activity in the wild. However, studies of cetaceans in the wild can be extremely difficult and only provide information on a limited time scale. To further investigate the clicking pattern of these animals, vocalizations of two captive harbour porpoises held at the Fjord & Bælt facility in Denmark were recorded. A single Cetacean-Porpoise Detector (C-POD, Chelonia Ltd., Mousehole, UK) was deployed at the exit of the facility's porpoise pool over a period of one year, between June 2016 and June 2017. A number of factors were tested for possible influence on the acoustic activity of harbour porpoises. There was a pronounced diurnal pattern in acoustic activity, with a clear peak around midnight. This was not dependent on water level or the available daylight and is in line with previous research. Interestingly, as opposed to the field studies, no effect of lunar phases was observed. This data provides an extremely fine-scale insight into harbour porpoise vocal activity and raises some interesting questions regarding the differences from results obtained in the wild, such as whether the diurnal clicking behaviour pattern is a result of an intrinsic physiological rhythm or the behaviour of porpoise prey.

AN23 First characterization of whistles produced by common bottlenose dolphins *(Tursiops truncatus)* of the Gulf of Ambracia, Greece

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The Gulf of Ambracia is a 400 km2 semi-closed embayment in western Greece hosting one of the highest density of common bottlenose dolphin (Tursiops truncatus) in the Mediterranean Sea. While the species' ecology has been well investigated, acoustic studies have never been undertaken. Boat surveys were conducted between July and September 2017 to record dolphin vocalizations in an attempt to obtain the first description of whistles produced by this bottlenose dolphin population. 21 hours and 32 minutes of recordings were made via an omni-directional SQ-26-08 hydrophone deployed from a 5.80 m long powerboat during 14 surveys. Overall, 2188 whistles were isolated, and their start, end, minimum, maximum frequencies, as well as the frequency range and the duration of the Fundamental frequency contour were manually measured. Whistles had mean duration of 0.82 seconds (range=0.13-4.01s), mean frequency range of 6.26 kHz (range=0.17-18.69 kHz), mean start, end, maximum and minimum frequencies of 8.66 kHz (range=0.84-21.72 kHz), 7.44 kHz (range=1.68-19.49 kHz), 12.30 kHz (range=2.25-22.83 kHz), 6.04 kHz (range=0.84-13.80 kHz), respectively. All the acoustic parameters were significantly different (Ztest; $p<0.05$) from those reported in earlier studies from other areas of the Mediterranean (Croatia, Greece, Sardinia). Several factors could be responsible for promoting these differences. The isolated nature of the Gulf, the high dolphin density and the genetic differentiation from the surrounding Mediterranean populations, as well as lower levels of underwater noise are amongst them. This study is the first ever characterisation of whistle vocalizations from bottlenose dolphins in the Gulf of Ambracia. As such, the results represent baseline information for future acoustic studies with bottlenose dolphins exploring the geographic

and temporal variation of phonations, and examining the acoustic emissions in relation to specific behaviours and habitat characteristics. This will aid the understanding of the acoustic ecology of the species in the area.

AN24 Long-term Static Acoustic Monitoring of harbour porpoise *(Phocoena phocoena)* at the Galway Bay Marine and Renewable Energy Test Site in Ireland

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Potential environmental effects of Wave Energy Converter (WEC) installations and operations on small coastal cetaceans are, to date, poorly documented. Since the wave energy industry is still in its infancy, pilot-scale projects may be used as baseline to assess responses of harbour porpoises to WEC structures. Since 2006, individual WECs have been intermittently deployed and functioning at the Galway Bay Marine and Renewable Energy (MRE) Test Site, in Ireland. Galway Bay supports an important population of harbour porpoises (Phocoena phocoena). Over a 10-year period, three research projects (in 2006-2007; 2009-2010 PReCAST project; 2014-2016 SmartBay project), used Static Acoustic Monitoring which employed self-contained click detectors (T-PODs and C-PODs). Archived data from these different projects were used to investigate variations in harbour porpoise temporal occurrence and foraging activity in the vicinity of the MRE Test Site and to relate potential changes in these patterns to the WEC deployment and operation. Harbour porpoises exhibited strong seasonal patterns with a peak in the frequency of occurrence in summer during the breeding season and in winter in which foraging activity increased. Diel and tidal patterns were highly variable between seasons. Observed diurnal and nocturnal patterns in harbour porpoise presence and foraging activity highlighted the complexity of their diel rhythmic behaviour. Harbour porpoises used the site under specific tidal conditions. Changes in these natural patterns were observed throughout the WEC deployment and functioning period. Harbour porpoises were less present at the site after the WEC deployment period than before, implying they exhibited long-term displacement and avoidance behaviour regarding anthropogenic disturbances. Their foraging behaviour however increased in the vicinity of the WEC suggesting a local enhancement of the feeding ground with higher prey availability. This long-term study therefore provides fine-scale baseline information to help design and enforce effective mitigation measures.

AN25 Spatial orientation in acoustic presence during seasonal migration of free-ranging harbour porpoises *(Phocoena phocoena)*

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Harbour porpoises migrate seasonally into German and adjacent waters. Migration over large distances requires a navigational system for orientating towards their destination. One of these systems could be acoustical orientation, since porpoises are known to use echolocation clicks in familiar surroundings to orientate towards prominent landmarks, but it is not clear whether these so called landmark sequences are also used more frequently during large scale navigation. In this study statistic acoustic monitoring was used within a one year period in the German Baltic Sea to record harbour porpoise echolocation clicks, to examine whether landmark sequences are part of harbour porpoise lager scale navigation and whether this pattern can be used to identify seasonal migration of the species. Beforehand criteria for this echolocation pattern were defined to distinguish them from other echolocation patterns. Analyses of this echolocation click pattern showed generalizable parameters for classification which resulted in the following criteria: (1) A continuous decrease of inter-click intervals (ICIs), (2) ICIs below 400 ms, (3) IcIs below 20 ms cannot be reliably attributed to landmark sequences, (4) Duration of minimum 25 s, (5) Frequency between 130 kHz and 150 kHz. Furthermore, the comparison of harbour porpoise presence and detected landmark sequences showed no positive correlation with known seasonal migration times. Sequences were rather found to be associated with feeding behavior and high porpoise occurence, indicating that porpoises may stay in an area for longer and are then familiar with their surroundings. Therefore, landmark sequences may be useful for identifying natural behavior in an steadily used habitat. This behavior may be also useful to analyse behavioural changes due to anthropogenic impacts such as pile driving for offshore wind farm or boat noise. In terms of migration of harbour porpoises, other orientation systems may be more important and should be investigated in future studies.

AN26 Soft start of seismic array - time to step it up?

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1995 the JNCC (Joint Nature Conservancy Committee) in the UK published the first set of mitigation guidelines. From

the outset the use of the soft start or ramp-up has been a basic requirement of all seismic mitigation strategies. However after 22 years of use while seeming logical, there really is no evidence that the soft start works in removing animals from the zone in which injury might occur. Universally all published mitigation guidelines require the soft start to be a gradual increase in acoustic pressure. However in March, 2017 the IOGP (International Association of Oil and Gas Producers) published a report which suggests a stepped increase in acoustic energy. Acoustic energy it is recommended should be increased in 6dB steps, which is a doubling of sound volume or acoustic pressure at each step. The logic of the current soft start approach is examined and of that proposed by the IOGP, with an investigation of the logic, science and assumptions behind this method. Current known behaviours of marine mammals in respect to the soft start or full power is summarized and how this might indicate effectiveness of the soft start is discussed, with a view to developing appropriate mitigation procedures around the soft start, as well as a soft start technique, determined by best industry practice and scientific evidence.

AN27 Intra population variability of whistles characteristics in a free-ranging bottlenose dolphins (Tursiops truncatus) population

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Because bioacoustics is a recent discipline, the importance of behavior and sociality on the vocal production of marine mammals is not very well known. The aim of this study is to determine the importance of intra-population variability on the whistles characteristics of free-ranging bottlenose dolphins (Tursiops truncatus). A boat-based campaign has been conducted from the 2 February 2016 to the 22 August 2016, covering a total of 51 days at sea and recording 129 free-ranging bottlenose dolphin sightings in the Ria of Arousa (NW Spain). A total of 75 hours of behavioral observations and simultaneous recordings of 15 different bottlenose dolphin social groups were done. From these recordings, 337 tonal, frequency modulated whistles of good quality were selected. After spectrogram and statistical analysis, this study highlighted that some factors driving the social life of Tursiops truncatus may have an impact on whistles characteristics of the population of bottlenose dolphins of the Ria of Arousa. Among these factors, we found that the behavioral activity, the seasonality, the presence of calves and the group size may strongly explain whistles variability observed, particularly in term of variation of minimum frequency, frequency modulation and duration of the whistles. In front of this significant intra-population variability of social communication for this population, samples precautions have to be taken in future studies, particularly when different populations will be compared. Indeed, it would be crucial to juxtapose similar data in term of behavior, period of the year, group size and composition in order to take intra population variability into account.

APH ANATOMY & PHYSIOLOGY

APH01 Where's the air? A novel way to find out how wild echolocating whales manage air for sound production in deep dives

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Whales use air to produce sound underwater presenting challenges for species that echolocate for food in deep dives; air volumes reduce with depth following Boyle's law with only 1% of the surface volume available at 1000 m. How whales manage this supply to produce clicks throughout long dives remains an open question. Clicks are produced pneumatically as air is passed from the nasal passage to the vestibular sacs via the phonic lips. Here we show that resonances of these air sacs when excited by clicks can be detected in on-animal sound recordings. We hypothesized that resonant frequency should be inversely related to the air sac volume which will change with ambient pressure and click-by-click air movement. To test this, we applied a model for the resonant frequencies of fish swim bladders to predict air sac volume in 33 short-finned pilot whales Globicephala macrorhynchus tagged with DTags. We found that (i) the vestibular air sacs increased in volume during a click train with each click adding roughly 50 µL of air, and (ii) vestibular air sac volume decreased by a factor of more than 10 during occasional short (1-2 s) pauses in clicking indicating that air is recycled back into the lower nasal passages. Thus, pilot whales must pause to recycle air every few hundred clicks, but the timing of this can be chosen to minimize the impact of these silent periods on biosonar-based foraging. Air volume is also related to click amplitude and so air usage can be reduced by decreasing the intensity

of clicks and therefore the detection distance of prey. Although air sac resonances are particularly apparent in pilot whales, similar patterns in other tagged toothed whales suggest that this mechanism of gradual air movement during clicking and recycling during pauses is a central driver of echolocation behaviour.

APH02 Morphological and histopathological study of the larynx of odontocete cetaceans stranded in the Canary Islands

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The morphological adaptations of the respiratory system in odontocete cetaceans for an aquatic life include a separation of the digestive and respiratory tracts at the pharyngeal level, as well as the modifications of the laryngeal cartilages in order to prevent the entry of water into the tracheal lumen during the swallowing of the food. The aim of this study is to review the laryngeal anatomy and histology in 3 species of dolphins stranded in the Canary Islands. Likewise, different pathological findings at the larynx are described. The anatomical study allowed to observe the formation of the "goose beak" with the epiglottic cartilage of hyaline nature and the incomplete ring morphology of the cricoid cartilage. Histologically, the presence of hematic lacunae in the submucosa is described, as well as multifocal lymphoid tissue in a lateral arrangement, not previously described in the literature, and moreover, the presence of vascular and round-shaped-structures inside the growing cartilage. The histopathological study allowed us to describe a variety of lesions in the different tissues: in the mucosa, haemorrhages and diffuse lymphoplasmacytic interstitial cell infiltration in lamina propia; in skeletal muscle, presence of intramyofibrillar structures compatible with Sarcocystis spp., inflammatory infiltrate, and intramyofibrillar structures compatible with complex polysaccharide inclusions; in the crypts and associated lymphoid tissue, pyogranulomatous tonsillitis. There are scarce descriptions in the literature about the anatomy and associated pathologies of the larynx in cetaceans; in this study we have noticed that the presence of lesions is more frequent than expected.

APH03 Cranial nerves in dolphins

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There is no detailed description of the topographic anatomy of the cranial nerves in cetaceans. For the first time, this was investigated in detail in a 76 cm long (late-term) formalin-fixed foetus of the Risso's dolphin (Grampus griseus), a marine delphinid species of about the same size as the well-investigated bottlenose dolphin (Tursiops truncatus). Macroscopical dissection revealed the course of cranial nerves from their origin inside the cranial cavity to the respective periphery. As in adult dolphins, the olfactory nerve (N. I) was not present in the dissected foetus. The course of the other cranial nerves (Nn. II to XII) reflects the mammalian bauplan. The optic, trigeminal, facial, and vestibulocochlear nerves (Nn. II, V, VII, VIII) of the Risso's dolphin show diameters of 1.5 mm, 5 mm, 2 mm, and 2.5 mm, respectively. This is in contrast to the situation in adult dolphins (T. truncatus) where the N. II equals and the N. VIII exceeds the dimensions of the N. V. Accordingly, the sensory world of neonate dolphins should be different from that in adults although dolphins are extremely precocial mammals. This immature sensory system may prevent young toothed whales from detecting fishing gear by means of echolocation which may explain why calves are heavily threatened by incidental bycatch.

APH04 Evaluation of different methodologies for the morphological analysis of the spiral ganglion of cetaceans

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Damage to the inner ear of cetaceans has been suggested as a potential biomarker of acoustic contamination, linked in some cases to stranding and death. In the physiology of sound acquisition, the spiral ganglion plays a key role in the auditory pathway and could be associated with injuries caused by acoustic contamination. However, its anatomical location characterized by surrounding bony structures, makes the anatomical and anatomopathological study of the spiral ganglion a difficult task. In fact, with the aim of obtaining high quality tissue samples, a perfect balance between decalcification and the preservation of neural components must be achieved. Based on these considerations, we decided to evaluate different methodologies for spiral ganglion sample preparation and preservation. A total of 10

ears obtained from different cetacean species stranded in the Canary Islands were analysed. Ear samples were fixed in 4% neutral-buffered formalin. Samples were distributed in 3 groups based on the decalcifying agent used: EDTA, 15% formic acid and 10% hydrochloric acid. Samples were incubated at room temperature and the decalcifying solution changed once a week. The following parameters were evaluated for each solution: decalcifying time, ease of sectioning, morphological and antigenical preservation. Histochemistry and immunochemistry staining were also used in order to study the morphology and the antigenical preservation of the spiral ganglion. 10% hydrochloric acid had the shortest decalcification time, but damaged the tissue extensively. Both 15% formic acid and EDTA decalcification solutions had a longer decalcification time, but showing a better preservation of neurons. However, a better cell morphology and staining was observed on those ears pre-treated with EDTA solution. Therefore, we suggest that decalcifying methodologies based on EDTA solutions should be used to obtain the highest quality samples for studying cell morphology and possible damage of the spiral ganglion of cetaceans.

APH05 First records of sperm whale (Physeter macrocephalus) with anomalously white pigmentation in the Tyrrhenian Sea. A living, Mediterranean Moby Dick?

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Anomalously pigmented cetaceans seem to occur in low frequency. Hypopigmentation in cetaceans can be the result of different conditions, e.g. albinism, leucism, piebaldism, vitiligo, senescence or diseases. A review of anomalously white cetacean records for the Mediterranean Sea resulted in only very few cases. We present here the first 3 sightings of anomalously white sperm whale (Physeter macrocephalus Linnaeus, 1758) reported for the Mediterranean basin. All sightings were made opportunistically off Sardinia Island (Italy) beyond the continental shelf and were documented by photographs and videos. The first encounter occurred on May 28, 2006, in the central-western Tyrrhenian Sea. An unusually white-yellowish sperm whale was observed in association with four normally pigmented individuals. The second one occurred on August 3, 2015, in the central-western Tyrrhenian Sea, when a single white-yellowish sperm whale was encountered. The third sighting occurred on June 18, 2016, in the southern Tyrrhenian Sea. On this occasion, a white sperm whale was sighted in a group of 6-8 normally-pigmented animals. Performing photo-ID analysis, we were able to identify the animal sighted in 2006 and the one in 2015 as the same individual. Video frames recorded during the third sighting did not allow us to confirm recapture between 2016 and the 2006-2015 white whale, although there are elements supporting this hypothesis. The atypical colouration showed by these sperm whales, can be ascribed either to a form of leucism or albinism. Lacking observations of the eye colour and genetic samples, it is not possible to narrow the condition down. Several studies underline the behavioural, physiological, and ecological costs that may affect anomalously pigmented cetaceans. Our re-sighting after 9 years suggests the potential longevity of these unusual specimens in the wild. Considering the scarcity of available literature on the topic, we encourage reporting these rare encounters.

APH06 Dynamic of dentin and cement deposited on vestigial teeth of the Pacific walrus

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Vestigial teeth of the Pacific walruses on the Chukotka Peninsula (Russia) have been examined: the second incisor, the fourth premolar, and the first molar on an upper jaw; the third incisor and the first molar on a lower jaw. Vestigial teeth were extracted from all available jaws of dead walruses in age 5 year and older, without selection. A total 121 vestigial teeth from 94 walruses were examined. We made two longitudinal sections from middle of each tooth. The cement and dentine layers were counted in scans of the sections using Adobe Photoshop CS3 Software. From the whole samples (119 teeth) it was succeeded to define number deposited of dentine for 109 vestigial teeth. 32.1% of teeth had one dentine layer, 56.9% of teeth had two dentine layers, 9.2% of teeth had three dentine layers, 0.9% of teeth had four dentine layers, 0.9% of teeth had five dentine layers. Thus, taking into account number of dentine layers the most of vestigial teeth grew up along the length of teeth for the first two years. The maximum number of cement layers found on a vestigial tooth was 35 layers. In total, there were 5 individuals (6 teeth) from 94 (119 teeth) which had 20 and more cement layers. The majority of vestigial teeth (85.7%) had 15 cement layers or less, 59.7% of them had 10 cement layers or less. Average value of total number of cement layers (n=119) at a tooth wall was 10.6+4.81 layers (med=9). It demonstrates the early slowdown of cement layers deposition on vestigial teeth. During growth of a walrus organism there is also active growth of functional teeth. At that time cement layers on vestigial teeth can regularly be deposited but after 10 years, when growth of an individual is slow downed, this regularity sharply decreases.

APH07 The seasonal buoyancy budget of harbour porpoises *(P. phocoena)* during dives

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The harbour porpoise (Phocoena phocoena) is one of the smallest cetaceans. It inhabits temperate and Arctic waters with large temperature fluctuations between seasons. Therefore, this marine mammal is characterised by extreme blubber accumulations in preparation for cold winter conditions. According to Boyle's law and as blubber has a lower density than seawater, a question raises of weather the large accumulation of blubber during winter imbalances the equilibrium of buoyancy forces for the animal while diving. Density measurements of tissues from harbour porpoises were used as input to a model investigating the effect of variations in blubber thickness of the animal's buoyancy. Both data from lactating females, pregnant non-lactating females, immature males and females as well as calves were used. The model shows that porpoises are positively buoyant while being at the surface, but neutrally buoyant at 10 to 20 meters of depth depending on blubber mass augmentation and diving tidal volume. The largest variation in buoyancy for a surfaced animal is caused by the amount of air inhaled; however at 10 m depth, the lung volume only contributes with approximately 30 % to the animal's buoyancy and its contribution continues to decrease with depth. The results indicate that the increased blubber thickness during winter has little effect on the buoyancy of porpoises while foraging. The predictions of the model were tested using data from 3 tagged porpoises, as well as anatomical data from scanned skeletal parts of 32 mainly bycaught individuals. Dtag data from wild harbour porpoises in Danish waters, reveal glides to the surface beginning within 1-2 m above the depth of neutral buoyancy predicted by the model. The anatomical data indicated a possible physiological balancing mechanism of bones being more dense in winter than in summer; this data needs however verification with a better method to estimate the density of the scanned bones.

APH08 Prediction of the cochlear frequency map for beluga

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Cochlear frequency maps (i.e. frequency distribution along the cochlear spiral within the inner ear) can be used to estimate the frequency characteristics of a source that may have caused hearing damage by acoustic overstimulation. In mammals, the base of the cochlea encodes for high frequency sounds, while low frequencies are detected in the apex but species-specific maps are lacking for marine mammals as they require the animal to be sacrificed. Morphometric variation occurs in cells of the organ of Corti (the hearing organ) from the apex to the base of the cochlea. These changes in cell shape and spacing are related to the frequencies encoded at different locations, as shown in the guinea pig. Here, we present the first prediction of the cochlear frequency map for the beluga whale using traditional and geometric morphometrics of the organ of Corti cells from scanning electron micrographs. We selected numerous landmarks of the cuticular plate (apical pole of the organ of Corti cells) to characterize its shape in 10 locations along the spiral. We analyzed 7 beluga inner ears to have a better understanding of the inter-individual variability. We extrapolated the correlation between the shape of the organ of Corti and its respectively coding frequencies from the mustached bat (Pteronotus parnellii), a species of echolocating bats that has an organ of Corti ultrastructure which is largely comparable to those of toothed whales. We then partially validated our predictions for the beluga by correlating inner ear morphology with

auditory sensitivity in the same individual. Auditory evoked potentials were measured for a beluga with hearing loss, particularly severe in the high frequencies, and the cochlear analysis revealed severe lesions in the cochlear base. The ability to combine morphological and auditory data is crucial to validate predictions of cochlear frequency maps based on morphological features.

APH09 Dorsal fin vascular anatomy in the Indian Ocean humpback dolphin *(Sousa plumbea)* and the Indo-Pacific bottlenose dolphin *(Tursiops aduncus)*

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In recent years, animal welfare concerns have been raised increasingly in relation to remote tagging studies, highlighting the value of basic anatomical knowledge to facilitate both species-specific and less invasive tag design. Evaluations of the conservation status of humpback dolphins have raised the debate about potential satellite telemetry studies on the genus. To date, there have been no investigations into the vascular anatomy of the dorsal fin and hump of humpback dolphins (Sousa spp.). For this purpose, magnetic resonance imaging (MRI) examinations were carried out on the dorsal fins of six Indian Ocean humpback dolphins (Sousa plumbea) and two Indo-Pacific bottlenose dolphins (Tursiops aduncus) for comparative purposes. The results allowed a morphological elucidation of the topography of major blood vessels in the dorsal 'hump' of Indian Ocean humpback dolphins Sousa plumbea and demonstrated that the small dorsal fin and hump combined present a larger surface area (50264.74 mm2) than the dorsal fin in T. aduncus (48402.83 mm2). Furthermore, the degree of ramification of the blood vessels was bigger in S. plumbea than in T. aduncus. Implications for thermoregulation, particularly of the testes, are enigmatic since the vascularization of the hump in S. plumbea lies deeper than in the small dorsal fin. The results show that data on the vascularisation of the dorsal fin of previously unstudied species through MRI can improve minimally-invasive tag design and might assist in the understanding of the function of this structure in other cetaceans.

APH10 Investigations of the Reproduction Biology of Seals from the North and Baltic Seas

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Since harbour (Phoca vitulina) and grey seals (Halichoerus grypus) are the top predators in the North and Baltic Seas they are affected by different anthropogenic influences like noise- and chemical pollutions, fisheries and by-catch. Those effects lead to changes in population dynamics, as well as in reproduction success. A database of by-catched and stranded or killed individuals serve as the basis for this study to examine the ovulation, pregnancy and birth rates. The uteri and ovaries were examined and the following reproductive features on the ovaries were recorded: Corpus luteum (Cl), Corpus albicans (Ca), tertiary follicle and reproductive parameters like pregnancy, lactation and earlier parturition. Half of the examined individuals were sexually mature. There is a decline of the pregnancy rate over the timespan from 1996 to 2016 in both species. The ovulation rates also show a decline over the timespan (1996 to 2016). In general, individuals from the North Sea have more findings than the ones from the Baltic Sea. Overall this study shows the population dynamics of seals based on a data acquisition over such a long timespan, as it has never been taken into account in other studies.

APH11 Light postcranial skeleton vs heavy skull: a possible deep diving adaptation in beaked whales *(Cetacea: Ziphiidae)*

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A pachyosteosclerotic rostrum is a synapomorphic feature observed in several beaked whales. Four hypotheses have been proposed in the last decades to explain the evolution of this peculiar structure: 1) for favoring deep diving (the ballast hypothesis); 2) for intraspecific fights between adult males; 3) for facilitating sound transmission; 4) for

intraspecific sexual display. According to the ballast hypothesis a heavy pachyosteosclerotic rostrum, combined with a light postcranial skeleton, moves the center of mass toward the head of the whale helping to rotate body for vertical diving. To better test this hypothesis, we computed the center of mass of the skeleton of three beaked whales (Hyperoodon ampullatus, Mesoplodon bowdoini, and Ziphius cavirostris) and one dolphin (Delphinus delphis), all kept at the Museo di Storia Naturale, Università di Pisa. Moreover, analyses about the density of the vertebral column and radiodensity of the first thoracic vertebra, first lumbar vertebra, first caudal vertebra and phalanxes were performed. Radiodensity was estimated by means of Computed Tomography (CT) and Micro-CT. Our analyses confirm the significant displacement of the center of mass to the anterior part of the skeleton in beaked whales, with the most notable shift occurring in M. bowdoini, exhibiting the center of mass in correspondencee of the cervical vertebrae. The skeleton of M. bowdoini also exhibits the least dense trabecular bone tissue, both in the vertebral bodies and the phalanx. The common dolphin, on the contrary, shows the posteriormost position of the center of mass and the densest trabecular bone tissue of vertebral bodies. Although this preliminary study seemingly supports the ballast hypothesis, these results should be further strengthened by increasing the number of investigated species and also by analyzing the whole bodies in order to estimate the center of mass of the entire living whales.

APH12 How deep can we go. Dolphins of Kalymnos, a non-scientific approach turns into a science project

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How do two simple persons turn their life upside down in order to see a few dolphins? A project that revealed much more then anybody could understand and that surprises many scientists in this field. When it starts with just seeing some dolphins towards a collection with tons of data. Talking about the bottlenose dolphins (Tursiops truncatus) and common dolphins (Delphinus delphis) and on the sight observing many other species of sea life. A proper pod with FIN ID and observations of how they live act and get their life together with all the local threads. A growing pod as well with yearly new offspring. A pod that certainly knows the area they live in with one specific leader named MALE 1. A pod that mainly has its home on the north-west side of the island. But also a project that brings up more questions every time. Where do they live, where they go, how they communicate and what is the age difference in the group. How is the group build up, how many males, and females. Sometime we talk about teenage gangs. Sometime we talk about the oldies. We are looking forward to new observations, it's not a job but a hobby. But we make progress day after day after year. We are on top of it. How deep can we go? If we could get help, we could get more to know. Aware and protect is our ultimate goal. And maybe finally they realize the Natura2000 project towards Arginonda and Emborios.

APH13 Anatomical correlates of honest communication in southern elephant seals

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Contests for acquisition of resources are a striking examples of animal communication. Honest signalling happens when interactors use vocalizations to transmit reliable information about their phenotype. As per the source filter theory, vocalization formants can be an honest signal of phenotype because they depend on vocal tract size, that is constrained by age, body length and skull size. In southern elephant seal (Mirounga leonina), males establish dominance hierarchies that determine access to females, and vocalizations are the most important component of agonistic behaviour. We studied southern elephant seals in 2016 at Sea Lion Island (Falkland Islands). We estimated body length, skull size, and vocal tract length of 34 breeding males. We estimated body length by photogrammetry, and vocal tract length by videogrammetry. Briefly, we placed a scale in front of the vocalizing male, aligned to the middle plane of his body, and we took a high resolution video from the side of the subject. The larynx was clearly visible in videos of all males. From videos we extracted frames, in which we measured maximum vocal tract length. Each male was marked at birth, so his age was known. Overall, repeatability of measurements was high (R>0.80). Results confirmed the expected relationships between vocal tract, age, and size, but with some differences respect to other studies: 1) the relationships were less strong than the ones obtained in studies of captive subjects of other species (vocal tract length obtained by radiography of sedated subjects); 2) the relationships were stronger for the nasal part than for the buccal or common part of the tract; 3) although vocal tract size was related to age, the relationship was less strong than the one with size. Overall, our study is the first demonstration of an anatomical basis of honest signalling in a wild, naturally behaving, animal species.

BE BEHAVIOUR & ECOLOGY

BE01 Foraging interactions between south american fur seal and gentoo penguins in the Falkland islands

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South American fur seal (Arctocephalus australis) is distributed in the western South Atlantic and eastern South Pacific ocean. Breeding and non-breeding colonies of the species are found in the Falkland Islands, where large-scale commercial fisheries have been a subject to rapid development. The diet of the South American fur seal shows an overlap with all major fisheries, including the loligo squid fisheries off East Falkland. In 2017 strong direct interactions were observed for the first time between the loligo fishery and fur seals, and increasing colony sizes and lower availability of prey were suggested as possible causes. In this study, we observed each shoot and haul in the squid fishery between 1st September and 5th October, collecting data on pinniped species presence and behavior. A particular foraging association was observed between fur seals and gentoo penguins (Pygoscelis papua), two species that have previously been reported only to occasionally interact as predator and prey. Seals approached fishing vessels on most hauls and regularly fed on discards and the trawling nets after they reached the surface. On more than ten occasions, a group of fur seals observed approaching the fishing vessel was closely followed by a group of 30-40 gentoo penguins. The penguins followed fur seals as they changed positions between different discard sites and the nets. As it has been suggested that trophic overlap in the study area was mediated by interspecies differences in foraging behavior and spatial partitioning of foraging areas, we discuss if fisheries at the Falklands Islands might have important consequences for competitive interactions and a possible reason for this particular foraging behavior.

BE02 Fishing practices cause a concerning alteration on the behavior of three odontocetes species in the Istanbul Strait

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The pressure of industrial fishing practice has grown globally in the last decades, leaving no silent zones for cetaceans. Its presence comes with short and long consequences on cetaceans. Short term consequences include area avoidance and behavioral changes. Long term effects include injures, decrease of reproductive success, permanent area abandonment or even death. Fishing vessels represent a specific type of stimulus to cetaceans as it disturbs the animals, affects the prey availability and has associated risks such as by-catch. The Istanbul Strait is a key area to study the anthropogenic disturbances on cetaceans due to the heavy human pressure on a narrow area where at least one porpoise and two dolphin subspecies are regularly present. The current study investigated the effects of fishing vessels on harbor porpoise, bottlenose dolphins, and common dolphins. Land surveys were conducted weekly, in the Istanbul Strait and its adjacent waters between September 2011 and September 2013. The current results showed significant changes on the behavior of the three species, with an increase of foraging behavior on bottlenose and common dolphins, and an increase on the time spent traveling on harbor porpoises in the impact budget (in the vicinity of fishing vessels), with the associated consequences. In the case of bottlenose and common dolphins, these changes are likely to result in entanglement and by-catch, with other serious consequences, such as the alteration of their foraging techniques, relying on humans. Regarding the harbor porpoises, the notable increase on traveling can decrease the energy intake and result in temporal or permanent area avoidance. Despite the behavioral alterations, when the fishing vessel number increased, the sighting probability of bottlenose dolphins decreased. The current study provides the first insight on the negative consequences of fishing vessels and highlights the need of urgent management strategies directed to fishing industries.

BE04 A high-risk prey for grey seals

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Grey seal (Halichoerus grypus) numbers have rapidly increased in the southern North Sea, followed by an increase in strandings. In autopsies performed over the past five years on grey seals washed ashore in Belgium, we recorded three cases of asphyxiation caused by a common sole (Solea solea). In two of the cases, concerning adult males, the sole

had completely entered the trachea as such efficiently blocking it. In the third case, of a juvenile grey seal, only the head of the fish blocked the trachea. It does not come as a surprise that common sole was involved in all cases. This fish has been linked to other cases of marine mammal asphyxiation, such as recently in two pilot whales (Globicephala melaena), a bottlenose dolphin (Tursiops truncatus) and six harbour porpoises (Phocoena phocoena). Common sole is very agile, with an ability to bend longitudinally as well as laterally. It is one of the most common demersal fish species in the southern North Sea. Unlike some larger (round)fish species or other flatfish, it can be (and is) swallowed as a whole by grey seals. The emergence of this cause of death (12% of all grey seals (N=26) and 20% of all adults (N=10) with a known cause of death) between 2013 and 2017, seems to be linked with (1) increasing numbers of grey seals, and (2) common sole doing well in Belgian waters compared to other potential prey. In these waters, with predominantly soft sediment, it seems to have become the most popular prey for adult grey seals, which apparently comes with a risk. It is worth performing even limited autopsies on stranded grey seals, including on decomposed, adult males, as this cause of death is easily identified.

BE05 Intraindividual variation in δ13C and δ15N isotope values in skin and baleen plates

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In the last decades, the analysis of stable isotopes has become a default tool to investigate feeding ecology and In the last decades, the analysis of stable isotopes has become a default tool to investigate feeding ecology and migratory patterns in cetaceans. Nevertheless, several authors have pointed out some methodological issues that must to be solved in order to reduce variability. One topic of great concern is the variation that might occur within a single individual tissue. Tissues are not totally homogeneous and show differences in pigmentation, size, thickness and function. Because accessing to cetaceans may be challenging, it's difficult to have a standardized sampling that assures that all samples come from the same position inside an animal. In order to address this issue, we have investigated the possible differences in isotope ratios that can be found in different positions of two of the most analyzed tissues in stable isotope studies in whales: skin and baleen plates. To assess if the position or coloration of the baleen plate affect to the stable isotope profiles, we analyzed the δ13C and δ15N values of 6 baleen plates, collected from different positions along the mouth of a fin whale. In the case of the skin, we collected and analyzed samples from dorsal and ventral positions in 28 fin whales. The sampled whales had been caught by Icelandic commercial whaling operations (Hvalur H/F) off western Iceland in 2015. Samples were sent to Spain under CITES permit ES/BB00207/151. No significant differences in isotope ratios were found among baleen plates or between skin positions, suggesting that, independently of the position or pigmentation, both tissues are homogenous regarding to their stable isotope values. Therefore, position of sampling should not be a reason of concern when conducting analysis of stable isotopes in skin or baleen plates. Research supported by project CGL2015-70468-R (MINECO/FEDER,UE) and the Fundació Barcelona Zoo.

BE06 Harbour Porpoise Responses to the Wind Farm Construction in the Moray Firth, NE Scotland

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Potential effects of wind farms to harbour porpoises (Phocoena phocoena) have been well studied in the southern North Sea, but less is known about the responses of porpoises to construction at deeper water sites around Scotland. This study aimed to assess the responses of harbour porpoises to pile driving during the first phase of construction of the 84-turbine Beatrice Offshore Wind Farm (BOWL) in North East of Scotland. A Before-After Control-Impact (BACI) monitoring programme was designed using deployments of 43 passive acoustic monitoring (C-PODs) within 25km x 25km impact and control blocks. Piling began on 2nd April 2017, and changes in harbour porpoise occurrence (Detection Positive Hours, DPH) were investigated between 1st March and 13th May. Results highlighted a seasonal decline in occurrence across all sites, but with a significantly greater reduction in occurrence in the impact block (66.7%) than the control block (25.7%) between the 'before' and 'during' periods. Reductions in occurrence were highest at sites within 15km of piling. Nevertheless, porpoise continued to be detected within the windfarm site through this early phase of the construction works.

BE07 Repeatability and foraging consistency of harbour seals in the Moray Firth, NE Scotland

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Many studies have assessed the effects of disturbance on the movements of marine organisms; this often requires robust baseline data on the variation in movement patterns over time. Movement patterns of harbour seals (Phoca vitulina) have been widely studied across their geographical range at a population level; however there is a paucity of information on individual variability. Several studies investigating repeatability and individual differences in seabirds have found that foraging behaviours and movement do vary between individuals, and that some individuals display highly repeatable patterns. Since both harbour seals and seabirds are central-place foragers it might be expected that individual harbour seals will display repeatable foraging behaviours as well. Here, we aimed to assess how consistently individual harbour seals foraged both within and between years. Thirty-two harbour seals were captured in 2017, fitted with GPS/GSM tags and tracked at-sea between February and July 2017. Four foraging trip characteristics were examined in a repeatability analysis to assess individual consistency within a year: (1) trip duration, (2) maximum distance from colony, (3) foraging range and (4) core range. Six individuals were also captured and tagged in previous years, allowing an investigation of the between-year consistency within individuals. Individual variation, whether it be highly consistent or highly variable, could obscure patterns observed at population level. Therefore knowledge of the behavioural variation of individuals could be critical to consider, particularly when population level behaviours are used to determine impacts of disturbance or human activities.

BE08 Are harbour porpoises displaced or quiet during construction work of offshore windparks?

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Harbour porpoises (Phocoena phocoena) face a wide variety of stressors with potentially harmful effects. Adverse effects on porpoises have been documented for pile driving during construction of offshore wind farms. In this study the impact of pile driving during the construction of the offshore wind farm DanTysk was analyzed using behavioural information in click activity recorded by C-PODs (Chelonia Ltd.). Harbour porpoise echolocation activity, landmark orientation and foraging were analyzed in 14 of 80 pile drivings. For each driving swim speeds and distances travelled were compared for the periods before (24 h), during and after pile driving (24 h). This was done based on a visual screening for feeding events and landmark orientation. The results show a distinct decrease in echolocation activity within 12 km radius during the construction of DanTysk. In addition results show that within a distance of 6 km harbour porpoises swam faster, traveled further and showed an increase in foraging activity in the 24 h after pile driving in comparison to before pile driving. Porpoises were recorded in close vicinity already below 20 minutes after cease of pile driving, indicating that not all porpoises evacuated the area of concern, but remained silent. This study is therefore a first indication that behavioural responses of harbour porpoises to pile driving are more complex than previously assumed. A moderately increased travel velocity after pile-driving may be an indication, that porpoises return to the pile driving site. Increased foraging activity on the other hand can be interpreted as a sign of reduced energy intake during pile driving and therefore increased food demands after cease of noisy activities. In general noise regulation should take all behavioural changes into account and this study is one step to reach this goal.

BE09 The "monastic" menu of the Mediterranean monk seal at Cabo Blanco Peninsula

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Important fishery activities are carried out in Mauritanian waters, close to one of the major breeding areas for Mediterranean Monk seal (Monachus monachus). Fisheries activities exert a strong pressure on the ecosystem and it is important to understand the ecological interactions between monk seals and fisheries. Information on feeding ecology of Mediterranean Monk seal in Atlantic waters is scarce, and analysis of stomach contents offers a valuable source of information to understand the trophic role of this predator in the area. Stomach contents of 35 seals from the Cabo Blanco Peninsula coast (Mauritania-Morocco) collected between 1993 and 2016 were analysed. A total of 312 individual prey from at least 25 species were identified. Fish was found to be the most abundant group (66 %N), with scianids making up just over half of the fish eaten. However, cephalopods were the most important prey

group in terms of reconstructed biomass (69 %W), mainly comprising octopuses (89%N, 98%W). Many of the species recorded are of commercial importance in fisheries in the area, like monkfish (Lophius spp.) (18%F, 7%N) and hake (Merluccius spp.) (4.2%F, 2.2%W). Multivariate (RDA) analysis suggested that juvenile monk seals show a preference for monkfish. No significant differences were found between sexes. Despite the extreme rarity of the study species and the consequent low likelihood of obtaining a substantially larger sample of stomach contents, dietary variation suggested that Mediterranean monks seals might be "opportunistic" feeders which take advantage of fish targeted by fisheries.

BE10 Elucidating The Cave Use Pattern of Mediterranean Monk Seal On Exploited Habitats

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Caves which provide shelter, resting places and refuges for breeding and nursing their pups, are of crucial importance for the survival of the Mediterranean monk seal. In this study we focused on 3 documented populations of monk seals inhabiting the southern coast of Turkey and evaluated their cave use pattern using infrared photo-traps. The focus of this study was to reveal regional differences among populations in relation to anthropogenic impacts. Cave activities of seals were classified as Sheltering, Resting and Nursing with duration periods calculated for each activity. Similarly, human activities were grouped as Tourism, Fishing, Agriculture and Industrial with proximities of each activity to the caves measured. Values obtained were then compared statistically. Results show that cave use patterns vary both seasonally and regionally. The general pattern of cave use observed is, seals enter the cave late afternoon and rest overnight, leaving the caves early next morning. As expected, caves located in areas of high Tourism related activity and Industrial development were used less frequently during the day-time in Summer compared to caves in the Marine Protected Area (MPA). Moreover some caves located near areas of intense touristic activity which are used frequently in Winter, were completely abandoned in Summer with the seal inhabitants moving to caves located within a protected area. This alone emphasizes the importance of Marine Protected Areas (MPA's) in the conservation of the species.

BE11 Characterising the relationship between habitat and prey in harbour porpoise candidate Special Areas of Conservation in the UK

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By early 2017, six candidate Special Areas of Conservation (cSAC) for the harbour porpoise had been submitted to the European Commission as part of the UKs commitment to establish a network of protected areas (Natura 2000) as required under the EU Habitats Directive (see http://jncc.defra.gov.uk/page-7369). The management of these sites requires an understanding of the impacts that certain activities have on the harbour porpoise and their habitats so that advice on likely significance of impacts and appropriate mitigation can be given.It is presumed one of the reasons for the persistent high density of harbour porpoise in these cSACs is because the habitats support important prey resources. Therefore, activities which impact the habitat may indirectly affect harbour porpoise through impacts on prey. We characterised the habitats and prey resource within the Southern North Sea cSAC with the aim of establishing important habitat envelopes for key harbour porpoise prey species. Following a review of literature, GIS was used to identify key environmental parameters and predict habitat for prey species to investigate the relationship between the various 'habitats' within the cSAC relevant to the distribution of prey (e.g. spawning grounds). This approach is designed to improve understanding of which habitats are key for prey species of harbour porpoise, which can then be considered alongside our understanding of how pressures impact habitats and what the subsequent impact on harbour porpoise is likely to be; ultimately, this will underpin management decisions.

BE12 Individual specialization in Falkland Islands southern elephant seal *(Mirounga leonina)* using stable isotopes of skin and fur

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Individual specialization can be an advantageous strategy that increases predation success and diminishes intra-population competition. However, trophic specialization can be a handicap in changing environments if the individuals are unable to use different prey or feeding grounds in response to change. Southern elephant seals Mirounga leonina allow us to explore this trade-off as they migrate, returning to haul out on land, for 2 extended periods, to breed and to moult. They fast during both periods, but the energetic cost is higher during the breeding season, leading to a poorer body condition after the breeding fast than after the moulting fast. We analysed the carbon (delta13C) and

nitrogen (delta15N) isotopic composition of skin and fur samples from Falkland Islands elephant seals. The isotopic values provided information about the foraging strategy of the seals during the pre-breeding season and pre-moulting season, respectively. We assessed individual specialization as the variation between periods of an individual with respect to the variability of the whole population. The high specialization and the correlation between periods suggest that each animal feeds in a similar region and on similar prey during both feeding migrations. The comparison with data from other populations and particulate organic matter suggests that the Falkland Islands elephant seals fed both on the Patagonian Continental Shelf and in the Southern Ocean. The high specialization among individuals within this species could potentially limit the individual capacity of adaptation and in the face of changing conditions or leave those abilities to the few generalist individuals.

BE14 Molecular determination of grey seal diet in the Baltic Sea in relation to the current seal-fishery conflict

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The conflict between seals and fisheries has been present for centuries. The seal population in the Baltic Sea has increased rapidly since the 1970s where a total protection was introduced in Denmark and Sweden. In recent years, many fish stocks have declined because of overexploitation and now it is relevant to investigate how much the seals can affect fish abundance and cause damage to fishing gear. Previous studies on seal diet have relied on identification of otoliths found in scats or digestive tracts, but this method can be inaccurate and cause underrepresentation of certain fish species. In this study we used DNA barcoding to analyse the diet of grey seals (Halichoerus grypus) from faeces collected on Tat, Denmark and Måkläppen, Sweden over several seasons. The diet analysis relied upon next generation sequencing, which allows identification of numerous species in samples yielding several thousand sequences per PCR product. The prey species were significantly different between the two locations and twice as many species were found in scats from Måkläppen than from Tat. The most common species at Tat were cod (Gadus morhua), sprat (Sprattus sprattus) and herring (Clupea harengus) while garfish (Belone belone), cod and herring were the most common species from Måkläppen. The seasonal variation was not as evident, but at Måkläppen the seals consumed significantly more garfish during spring. No yearly variation was observed between 2014 and 2015 on Måkläppen. Comparisons between data from the Atlas of Marine Fishes of Denmark showed a preference for cod in the seal diet, which is in conflict with the Danish National landings data, as cod is the far most valuable species for the fisheries.

BE15 Influence of interspecific interactions between two sympatric seal species on their habitat use and foraging habitat selection

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In the Northeast Atlantic, grey and harbour seals live in sympatry, with contrasted population dynamics. Although they share the same haulout as in the Firth of Tay (FoT) and in the Eastern English Channel (EEC) respectively in Scotland and France, little is known about their potential spatial overlap or partitioning at-sea. The habitat selection represents an important tool to evaluate the potential competition of interacting species. The objective of this study was to examine the foraging habitat selection and spatial usage of these two species in the FoT and EEC, depending on the influence of inter-specific interactions. We tagged 10 harbour seals and 8 grey seals in the EEC, and 9 harbour seals and 8 grey seals in the FoT. In both study areas, grey seals used more offshore areas: their medians trip maximum extent were 15 Km from their haulout sites; while harbour seals performed trips in more inshore areas, with median values of 4 Km and 5 Km for the FoT and the EEC respectively. Moreover, mixed models revealed that these two species selected different foraging habitats in the two study areas. In the FoT, grey seals selected coarse sediments, and tidal currents faster than 0.4m/s; while this feature had a negative influence on harbour seals' foraging habitat selection. In the EEC, grey seals selected foraging habitat over muddy seabed with strong tidal currents (>0.6m/s); while harbour seals selected low tidal currents over sandy seabed. These results suggested potential spatial and foraging habitat partitioning. This was quantified with the Bhattacharya Index, which supported the hypothesis of spatial partitioning as they were low representing 0.5 and 0.3 respectively for the EEC and the FoT. This spatial partitioning may represent the "ghost of competition past" allowing these two similar species to cohabit in a part of their range.

BE16 Categorizing different types of aerial leaps of white-beaked dolphins

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Dolphins are known to perform different types of aerial leaps, but little is known about their function. In this study, white-beaked dolphins were visually observed and photographed from a boat off Húsavík (Iceland). A total of 351 boat surveys were conducted from 8th of March until 30th of November 2017 on 196 days. White-beaked dolphins were sighted during 62 trips on 47 different days and aerial leaps were observed on 27 trips on 24 different days. Aerial leaps were mostly observed during July and August 2017 and filmed on 14 different days in this time period. Out of these sightings, more than 1,400 aerial leaps were filmed. One dolphin could jump from 1 to 30 times in a sequence. Different types of aerial leaps were observed with variations of their landings on the water surface. For 55 % of the aerial leaps the animal landed on its side, 40 % on the ventral side (abdomen) and 5 % on the dorsal side (back). These differences could suggest different functions for the leaps both in terms of visual and acoustic signaling. Dolphins is known to communicate by acoustic displays and it is possible that the landings on the water makes different underwater acoustic signals used for communication. Previous preliminary studies indicate that white-beaked dolphins use breaching to corral fish while hunting and during the courtship before mating in the summer months. Also in such situations, the different types of aerial leaps may fill different functions.

BE17 Whatcha saying? Evidence of production learning in a solitary common dolphin during interspecific interactions with a harbour porpoise

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Several cetacean species have the ability to change their acoustic repertoire (i.e., production learning) as a result of interactions with other species. This ability has mainly been observed in captive individuals and few cases have been reported for wild cetaceans. A long-term affiliative association between a solitary short-beaked common dolphin (henceforth common dolphin) and a harbour porpoise in West Scotland provided the opportunity to study this ability in wild cetaceans. Harbour porpoises produce entirely stereotyped narrow-band high-frequency echolocation clicks with peak frequencies around 130kHz. Clicks are emitted in trains and used for travelling, foraging, and communication purposes. Common dolphins' echolocation clicks are widely understudied. Available data suggests these are frequency banded (i.e., with distinct peaks and notches in their power spectrum) with peak frequencies below 67kHz. Common dolphins also produce other sounds for communication purposes, including whistles and barks. Data was collected during systematic and opportunistic surveys using a towed hydrophone array. Vocalisations of both species were recorded when interacting as well as when seen alone. Using custom-built algorithms, individual dolphin and porpoise echolocation clicks were extracted, and several parameters estimated, including amplitude, and peak and centroid frequencies. The dolphin regularly produced clicks with peak and centroid frequencies over 100kHz, centred around 120kHz, when accompanied by the harbour porpoise, as well as when alone. Typically, the centroid frequency varied within a click train, between values below 50kHz to over 140kHz. Other sounds were detected, including barks and buzzes, however no whistles were recorded. No changes in the porpoise acoustic repertoire were detected. The preliminary results of this study suggest the common dolphin changes its acoustic repertoire, likely as a result of the interaction with a harbour porpoise. This is the first time the common dolphins' ability for production learning (in the wild or in captivity) has been reported.

BE18 Activity patterns of resident bottlenose dolphins and the emission of bray sequences

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Common bottlenose dolphins (Tursiops truncatus) resident in the region of the Sado estuary, Portugal, emit the wide range of underwater vocalizations common in this species: tonal sounds (whistles), echolocation clicks and a variety of burst-pulsed signals, such as creaks, squawks or bangs. This work focuses in the brays series, a type of pulsed vocalization that combines gulps, grunts and squeaks in bouts and sequences. Bray series have been studied and reported in several populations of bottlenose dolphins, however their functional role has yet to be fully understood. Here, we studied the influence of a set of ecological and behavioural variables in the emission rate of this conspicuous vocalization. A Generalized Linear Model with a Binomial Negative Regression was used to test the influence of group size, depth,

location, pattern of activity, presence of vessels and tidal phase. The results show that group size, depth, location, vessels and tide are not relevant predictors of bray series' emission rates. On the contrary, the activity pattern had a significant influence on the bray sequences. Significantly higher rate of bray emissions were recorded during foraging (ß= 1.63±0.51), feeding (ß= 2.13±0.69) and socialization (ß= 2.06±0.81). These values support the notion that bray series are social calls produced during high-arousal events that involve complex and diversified motivational states.

BE19 Honest signalling in male and females southern elephant seals (Mirounga leonina)

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Honest signalling during agonistic contests is a very important component of animal communication, because it permits to resolve social conflicts without direct fights. As per the source filter theory, mammal acoustic signals can be honest because frequency formants depend on vocal tract length, that is structurally constrained by body and skull size. Although honest signalling has been tested more frequently in males, in many mammal species also females are using vocalizations to settle contests. The southern elephant seal (Mirounga leonina; SES hereafter) is the most polygynous and most sexually dimorphic of all mammal species, and vocalizations are frequently used to settle agonistic contests in both males and females. Therefore, honest signalling should be well developed, but phenotypic selection should act differently in the two sexes. We studied SES at Sea Lion Island (Falkland Islands), a small and isolated breeding colony, in which all seals are individually recognized and of known age. We recorded vocalization of 32 males and 88 females. We measured body size by 2D photogrammetry. We extracted the first five formants using PRAAT software, and we calculated formant dispersion. In both males and females, we found that frequency formants had the expected negative relationship with body size and age. In both sexes, the relationship with body size was stronger than the relationship with age. The relationship with both body size and age was stronger in males than in females. In both sexes, higher formants (four and five), that should be a better proxy of phenotype, had stronger relationships with both body size and age than lower formants. All together, formants are honest signals of phenotype in both male and female SES, but they are more accurate indices of phenotype for males than for females, as expected from the more important role of agonistic contests in male breeding behaviour.

BE20 Franciscana and Guiana dolphins breathing synchrony reflects the proximity to their partner

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Synchronous breathing may be a useful proxy for studying other, and perhaps more complex, aspects of cetacean behavior. Here we describe a study conducted in Babitonga Bay, southern Brazil, where we investigated the synchrony of breathing in two small populations of franciscana (Pontoporia blainvillei) and Guiana dolphins (Sotalia guianensis). The bay is affected by different sources of anthropogenic disturbances, such as boat activity and point-source pollution. We assumed breathing synchrony to be the inverse of the time between breathing surfacing displays of dolphins within a swimming pair, which we refer to as lag. The relationship between lag and anthropogenic and animal-related variables was evaluated with Generalized Additive Models. For franciscana dolphins, breathing synchrony was only positively related to the proximity between animals. Breathing synchrony in Guiana dolphins was positively related to both the proximity between animals and to group size, and varied significantly depending on the research boat used. Proximal characteristics (i.e., of individuals or of the group) of these dolphin species seem to be related to the synchronization in breathing more than to the environmental variables assessed here. Results presented expand the current knowledge of these two dolphin species and provide general insights into the breathing synchrony for cetaceans.

BE21 Long-term diet changes of a coastal predator in parallel to fishery development

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Stable isotope analyses have become an important tool in reconstructing diets, analyzing resource use patterns, elucidating trophic relations among predators and understanding the structure of food webs. Here, we follow a historical approach using stable carbon and nitrogen isotope ratios in bone to evaluate long-term diet change in Franciscana dolphins (Pontoporia blainvillei) in the Río de la Plata ecosystem. Furthermore, we used the same approach to reconstruct and compare the isotopic niches of Franciscana dolphin and two otariid species –South American fur seals (Arctocephalus australis) and South American sea lions (Otaria flavescens)– in order to first look at change over time in resource partitioning among these three apex predators, and, second, to ascertain whether current resource partitioning in the Río de la Plata ecosystem is the result of recent anthropogenic forcing caused by two types of changes: changes in the relative abundance of South American fur seals and sea lions; and changes in the availability of pelagic and demersal prey. We found long-time change in Franciscana diet, and observed that the trophic relationships among these three apex predator species of the Río de la Plata ecosystem have changed over time and that the isotopic niche segregation has diminished over time. This observed dietary change can be explained by at least two non-mutually exclusive mechanisms: (i) the decrease in the average size of demersal fishes due to intense fishing of the larger class sizes, which may have increased their accessibility to those species with a smaller mouth gape, i.e., South American fur seals and Franciscana dolphins, and (ii) the decrease in the abundance of South American sea lions as a consequence of commercial sealing.

BE22 Bottlenose dolphin (Tursiops truncatus) in the Sicilian Channel (Mediterranean Sea): occurrence, social structure and interaction with fishery

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Investigating the social structure is an important factor in cetaceans management and conservation, playing a key role in many aspects of population ecology and biology: it influences the genetic make-up, the spread of disease, and how animals exploit their environment .The importance of such an investigation is greater for those species listed in the Habitat Directive (92/43 CE), such as the bottlenose dolphin. Being listed in Annex II of the directive is required to select, designate, and protect sites that support this species as Special Areas of Conservation. For this reason, knowledge of the occurrence of these species is fundamental. From this perspective, the main goal of this study was to investigate the occurrence and social structure of the bottlenose dolphin in the waters off the Agrigento Province. Data were collected during summers 2016 and 2017 through photo-identification surveys, and subsequently analyzed to identify the residence patterns and the social structure of bottlenose dolphins in the area. Interactions of photo-identified dolphins with fishing activity was also considered and related to the social structure. During forty-three daily surveys, bottlenose dolphins were encountered thirty-two times: seven times over eighteen daily surveys in 2016, and twenty-five times over twenty-five daily surveys in 2017. Twenty-three specimens were identified in 2016 and approximately 80% of them were recaptured in 2017. In 56% of total occurrences from both 2016 and 2017, dolphins were engaged in feeding activity behind fishing boats. The half-weight index (HWI) was applied to quantify the frequency of association among individuals. Additionally, the social differentiation was estimated in order to measure the variability of the social system. This work will contribute to increasing knowledge about the bottlenose dolphin population in the Sicilian Channel, where there exists a resident population that frequently interacts with professional fisheries, and yet no management measures have been adopted.

BE23 Upcycling Fisheries Data: Utilizing active acoustics to estimate cetacean foraging areas in the Black Sea

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The conflict with fishery is a very important threat to the Black Sea cetacean populations. In addition to the damages incurred on the fishing gears by the dolphins, cetaceans are blamed to consume a significant part of the commercial stocks; which lead to demands on the removal of the cetacean hunting ban. Meanwhile, studies targeting the distribution, abundance and population trends of the cetaceans in the Black Sea are very limited. In comparison to marine mammal research, the interest and funds made available to the studies targeting commercially exploited species such as anchovy

are rather high. Consequently, there are several fish monitoring programs in the Black Sea. One such is the hydroacoustic surveys covering the southern half of the sea. Here we explore possibilities of making more out of accretion of fisheries active acoustic data; in favor of cetacean ecology research, to forge effective conservation proposals to ministries. Cetaceans can hardly be detected by active sonars however, their clicks are recorded in the echograms. These can be isolated by a recently developed, frequency response mediated methodology via post-processing software Echoview Software Pty Ltd. Here, it was assumed that the areas where cetacean click trains are concentrated may indicate their foraging activity; and the fishes aggregated there may indicate the type of their prey. Analysis are conducted to map cetacean foraging areas, in comparison to fish abundance and distribution, estimated from the same long-term AAM data. Categorisations of species based fish distributions were also conducted from TS differences, samplings, distinct school forms and environmental cues. This study has great potential to shed light on ever so indeterminate state of cetaceans in Black Sea, providing the scientific foundation to fishing and hunting ban decisions to be made.

BE24 Incorporation of simulated mid-trophic prey data from SEAPODYM improves the performance of large whales' distribution models

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Cetacean distribution models are important management tools that use biotic and abiotic predictors believed to be ecologically relevant. In the absence of actual prey data, other variables such as carbon and chlorophyll-a concentration have been used as proxies for prey. Recently, several studies integrated mid-trophic prey data derived from the spatially-explicit mid-trophic level model (SEAPODYM), assuming these data improved model performance by being more proximal to the predators. However, that assumption has not yet been tested for many species. In this study we investigated the effect of including SEAPODYM-derived prey data, at different temporal scales, in the predictive performance of large whale distribution models. We used sightings of sei (n=114), fin (n=152) and blue (n=60) whales recorded between 2001-2015 off the Azores archipelago, to fit Generalized Additive Models. Two main sets of models, including and excluding SEAPODYM outputs, were created for the Azores waters and then compared. For each of these, we further tested the effect of using either 'contemporaneous' (week of sighting) or 'climatological' (15-year averages, May-September) dynamic predictors. Model performance was evaluated using a subset of the sightings to compute goodness of fit and explained deviation. Contemporaneous models always performed better than climatological ones, regardless of the inclusion or not of SEAPODYM outputs, emphasizing the importance of choosing the appropriate temporal scale for dynamic variables. The inclusion of SEAPODYM-derived prey data improved model performance for fin and blue whales but not for sei whales. Results for the sei whale are in line with those from previous habitat suitability models and suggest that prey availability may not be an important determinant of sei whale distribution because the species mainly uses the area for travelling. These results show how habitat requirements vary according to behavioural motivations and reinforces the importance of placing this type of studies into a behavioural context.

BE25 A taste for squid: the prey of Cuvier's beaked whales (Ziphius cavirostris) and Risso's dolphins (Grampus griseus) in the Eastern Mediterranean Sea

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The feeding habits of apex predators like toothed whales are understudied in the Eastern Mediterranean Sea. To further investigate this topic we examined seven stomach contents from Cuvier's beaked whales Ziphius cavirostris (n=3) and Risso's dolphins Grampus griseus (n=4) stranded along the Greek coastline. The vast majority of prey remains belonged to cephalopods, while in one Risso's dolphin the only fish remains found was an entire skeleton of Trichiurus lepturus. Squid species identification was based on lower beaks, with the dorsal mantle length (DML) and total weight (TW) of each squid estimated by standard measurements from undamaged lower beaks. Only 46 of 1155 lower beaks (4%) remained

unidentified due to extended wear. We found thirteen cephalopod species, mainly pelagic and buoyant squid, in both predators: Ancistrocheirus lesueurii, Argonauta argo, Chiroteuthis veranii, Chtenopteryx sicula, Galiteuthis armata, Histioteuthis bonnellii, H. reversa, Octopoteuthis sicula, Illex coindetii, Ommastrephes bartramii, Todarodes sagittatus, Ancistroteuthis lichtensteinii and Onychoteuthis banksii. The most important prey species in terms of decreasing mean percent index of relative importance (mean %IRI) were H. bonnellii (33.1), H. reversa (21.8), O. sicula (18.1) and G. armata (15.7) for Cuvier's beaked whales (n=3) and H. reversa (29.3), T. sagittatus (22.4), H. bonnellii (9.35), C. veranii (8.2), A. argo (8.2) and I. coindetii (7.6) for Risso's dolphin (n=3). Excluding some large individuals of A. lesueurii, H. bonnellii, O. sicula, O. bartramii and T. sagittatus, both predators primarily consumed cephalopods of small DML (mean=95 mm, sd=50 mm, median=89 mm, n=926) and TW (mean=83 g, sd=91 g, median=45 g, n=926). These findings confirm that Cuvier's beaked whales and Risso's dolphins in the Mediterranean Sea feed mainly on small pelagic and buoyant cephalopods and occasionally complement their diet with large ommastrephids of which only I. coindetii is regularly targeted by the regional fisheries.

BE26 Does interspecific competition control local density and habitat use of harbour porpoises?

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Determining the drivers that are responsible for the fine scale distribution of cetacean species is fundamental to understand better how they respond to changes in their environment. Coastal cetaceans regularly exist in sympatry; nevertheless, ecological studies have been often based on a single species approach while ignoring the potential effects of inter-specific competition. In this paper, we used a generalized additive modelling (GAM) framework to carry out a comprehensive investigation of the key environmental (including the distribution of sympatric cetacean species) and anthropogenic correlates of habitat use and local relative density of harbour porpoises. The field effort entailed over three consecutive years of fieldwork from April 2014 to November 2017. In all, 273 daily boat surveys over a period of 38 months were spent in the field covering 9 417 km along the coastal and shelf waters of Galicia (NW Spain). A total of 1015 hours were spent in satisfactory conditions and 73 groups of harbour porpoises were monitored during 20 h. The unequal use of available habitat confirms that harbour porpoises present a fine-scale pattern of habitat selection along the study area. Our results indicate that there is a competitive exclusion of the harbour porpoises by common bottlenose dolphins in near-shore locations with high density of preys consumed by both species. Ours is the first study to show that both inter-specific competition and food availability play a significant role in determining the use of habitat and local relative density of a coastal cetacean species. These findings highlight the importance of considering the interactions between multiple variables in ecological studies on temporal and spatial scales, in addition to highlighting the importance of using a multi-species ecology approach in research and conservation management planning.

BE27 A matter of timing: can whale watching data provide essential information on cetaceans niche modelling?

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Good distributions estimates, especially for wide-ranging species, are essential to promote efficient management and conservation initiatives. Modelling methodologies flexible enough to accommodate temporal variations can be excellent tools to implement dynamic ocean management frameworks. However, the marine environment provides challenging conditions, which can make the building of accurate niche models difficult. The spatial-temporal variability of this environment together with the complexity and mobility of cetaceans are key elements to be taken into consideration. In the present study, we demonstrate the utility of datasets with a high temporal resolution (such as data obtained on whale watching operations) to produce better distributional estimates. We used 7 years of whale watching data from the MONICET platform in the Azores to model distributions for 10 cetacean species. We investigated the impact of modelling with environmental data of different spatial and temporal resolutions. A Maxent algorithm with a background selection correction was used to obtain ecological niche estimates for all the scenarios. Results showed that models for different species might vary in accuracy depending on the temporal resolution used. For species highly dependent on dynamic features, such as baleen whales, the selection of finer temporal resolutions for the environmental provided better results. No differences in model performances was found for species mostly influenced by bathymetric features (e.g. sperm whale). Whale watching data proved to be a useful source to characterize the temporal dimension provided the underlying sampling bias is corrected. While sampling programs covering an extended area can provide

a clear image of the spatial patterns, other sampling methods with high periodicity in relatively small areas can help to clarify temporal patterns.

BE28 Unusual events concerning the Mediterranean monk seal's feeding habits

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The Mediterranean monk seal, Monachus monachus, the rarest and most endangered pinniped, has been described as an opportunistic predator preying upon a variety of species which include bony fish, cephalopods and crustaceans. Cephalopods, mainly Octopus vulgaris, are among the most important prey along the Greek coasts and were found to dominate in the monk seals' diet in terms of biomass and number consumed. Here, we present some unusual events with respect to the species feeding habits. In October and November 2017, 12 loggerhead turtles (Caretta caretta) with a carapace length of 30-75 cm were found dead in Agios Nikolaos, Crete, Greece. They had severe injuries on their throats obviously caused by monk seals: one of the attacks was even videotaped. On Zakynthos Island, Ionian Sea, Greece, in summer and autumn 1994, 8 Caretta were found injured or dead with similar injuries and in 2010, 21 large Caretta were recorded bearing injuries attributed to predation by seals. Since the habitats of both these endangered species partly overlap, the implications for their conservation are obvious. In May 2017, a monk seal of a total length of 1,5 m was found dead floating 200 m off Rethymnon, Crete, with the arms of an octopus inside its digestive/respiratory system. It is well known the monk seals pound octopus on the sea surface in order to weaken them before swallowing, thus preventing suffocation by the octopus' arms. This juvenile seal, possibly not experienced enough, was obviously unable to subdue the octopus and it blocked its digestive/respiratory system. To our knowledge, suffocation of monk seals by octopus has not been described up to the present time as one of the natural causes of mortality. Only one similar event has been described from Australia where recently one bottlenose dolphin diet of suffocation by an octopus.

BE29 Group-size effect in haul-out behavior of Ladoga ringed seal (Pusa hispida ladogensis)

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Size, density and configuration of animal groups are factors which may affect behavioral budget of the individuals. The ratio between individual vigilance and beneficial activity (resting, feeding, playing) often shifts with changing of group characteristics. The most common is inverse relationship between vigilance and group size what is usually explained by hypothesis of collective vigilance. We investigated whether conspecific presence, group size and distance to neighbor impact on activity of the Ladoga ringed seal (Pusa hispida ladogensis) in haul-out groups. The seals occupy island coasts, islets and rocks of Lake Ladoga, NW Russia, during open-water period. Data collection was carried out in 2012-2016 at Valaam Archipelago and Konevitsa Island. 558 minutes of video records were processed with method of continuous recording,the duration of each record is 9-12 minutes. Resting and scanning behavior of focal animals in terms of duration, frequency and total percent of time was analyzed. Additionally, place and wave height are considered as predictors. Haul-out groups consisted of 1-72 individuals. Solitary seals were significantly more vigilant than seals in group (47±5.5% of time against 32±2.22%). The relation between individual vigilance and seal number was U-shaped and scan frequency, not duration, determines this relationship (third degree polynomial model explained 26% of variables, p=0.01). According to our model, optimal size of Ladoga seal haul-out group is around 50 individuals. Resting behavior had no relation with group size and distance to the nearest neighbor did not impact on behavior of focal individuals. Meanwhile wave height near haul-out site adjusts seal vigilance as a possible noise factor in informational channels. This research confirms adaptive significance of grouping behavior for the Ladoga ringed seal when hauling out, in contrast with haul-outs of nominative subspecies at ice fields. Haul-out sites allowing the seals to gather in great number are important in conservational perspective.

BE30 Nursing behaviour of mom-calf southern right whales at a breeding ground in South Australia

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During the early stages of development, mammals are reliant on their mothers, and the maternal care provided during this period is critical for offspring survival. For baleen whales, that generally reside in shallow, coastal waters during the first months of nursing their calves, it is largely unknown how important behaviors associated with maternal care, e.g. nursing and back-riding, are allocated at the nursing grounds. Here we test if the mom-calf pairs with neonate calves spend more time engaged in behaviors related to maternal care compared to mom-calf pairs with older calves. To test this hypothesis, we compared the activity time budgets of 51 southern right whale mom-calf pairs during the breeding season at a sheltered nursing ground in South Australia. Behavioral observations from the air were performed using a DJI phantom 3 drone. Body morphometric measurements of the 51 mom-calf pairs were obtained from July to October 2017, using a DJI Inspire 1 Pro, which was used to categorize the age classes of the calves. We show that both back-riding and nursing was more pronounced for neonatal calves compared to older calves, but with a slight increase in time spent nursing in the older calves as well as towards the end of the breeding season, suggesting that calves maximize their lipid stores before the migration to the feeding grounds. Further, we provide estimates of frequency and occurrence of these crucial behaviors related to maternal care in a healthy, undisturbed population which is showing strong recovery from whaling. These baseline estimates are important to identify possible disruptions of crucial nursing behaviors, and in the management of human activities in known nursing areas of this and related species.

BE31 Feeding aggregation of humpback whales in Kresta Bay (Anadyr Gulf, Chukotka) in summer 2017

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Little was known about the distribution of humpback whales in summer feeding grounds in the Western Bering Sea. The last whale survey in the Bering Sea region was conducted in 2005 and accidental observations were done from cruise ships. Before 2013 observations of humpbacks in the Kresta Bay were not really common. In August 2017 we conducted 15 boat trips in the Kresta Bay to photo ID humpback whales. In total 180 humpback whales were encountered and 83 individual whales were identified. The high frequency of encounters and the amount of humpback whales identified indicates feeding opportunities in this area. Comparison of these 83 whales with the Russian photo-identification catalogue showed that 3 match with whales spotted previously in the Anadyr Bay (in 2005 and in 2016) and with 6 whales of the Commander islands (in 2010, 2012 and 2014). That suggests that Kresta Bay became important feeding ground for humpback whales. Fishermen reported that since restrictions on fishing were enforced more humpback whales had been observed in the Kresta Bay. Further studies in the Kresta Bay as well as comparison with catalogues of winter grounds are needed to tell where the whales came from and if this is a new permanent feeding ground for humpback whales.

BE32 Using presence-only modelling to predict five cetacean species' feeding habitat use in Icelandic coastal waters: implications for conservation

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For migrating whales, resident dolphins and porpoises, Iceland represents a prime feeding habitat. However, knowledge on their feeding habitat preferences is lacking and the potential anthropogenic pressures on their feeding behaviour are relatively unknown. Our aims were: 1) to investigate the functional ecological relationship between environmental variables (EVs) and feeding distribution of five cetacean species in Icelandic coastal waters, and 2) to predict and identify feeding hotspot areas (within 7 bays located from south to northeast) for spring (March-June) and autumn (July-October) months. A species distribution model (MaxEnt) associated with opportunistic sightings (2010-2017) of surface feeding minke whale (Balaenoptera acutorostrata, N=436), humpback whale (Megaptera novaeangliae, N=156), white-beaked dolphin (Lagenorhynchus albirostris, N=123), harbour porpoise (Phocoena phocoena, N=121), and orca (Orcinus orca, N=28) occurring on the S (Vestmannaeyjar Islands), SW (Faxaflói off Reykjavik), and NE (Skjálfandi off Húsavík) coasts was used. We focused only on sightings where feeding had been identified using a standard protocol. Based on the literature, seven EVs were included in the models: depth, slope, aspect, sea surface temperature, chlorophyll-a concentration, tidal height, and distance to shore. The area under the curve (AUC) varied between 0.81 and 0.94 for all models. During the spring, aspect and chlorophyll-a were the most important variables; in the autumn aspect and slope were the most important. Predictions on the feeding distribution in the 7 bays showed strong seasonal variation and strong spatial segregation between each species. Both common minke and humpback whales preferred shallow, steep sloped coastal run-off areas in the north, while white-beaked dolphins, orcas, and porpoises were found to be more

widespread in the deeper waters of almost all bays. Our results identified potential feeding hotspots in several of the predicted bays, and highlights potential areas of conflict with human activities which should be considered for future management and conservation plans.

BE33 Behavioural analysis of Delphinus delphis in the eastern Aegean Sea, Greece

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Short-beaked common dolphin (Delphinus delphis) behaviour is analysed and compared in three different areas of the eastern Aegean Sea, Greece (Samiopoula Island, Marathokampos Bay and Lipsi Island area), as well as during each season in the waters of the south of Samos Island in Greece. Results have shown that D. delphis spent more time in the travelling and feeding states, in comparison to the other behavioural states. The travelling state is recorded as the passage from a feeding area to another feeding area. There is a significant difference between the three different areas. Samiopoula and Marathokampos areas are considered feeding zones, whereas Lipsi area is considered a travelling zone. There is also a seasonality of their activity budget: D. delphis spent more time feeding during spring (40.2% of the time observed) and autumn (66.7% of the time observed), relating to an assumed higher abundance of their prey Sardina pilchardus. They also spent more time in other behavioural states during the spring (milling: 8.0%, resting: 9.3%, socializing: 3.3%) due to the food availability. A correlation between feeding state and bow event is also recorded, as well as a correlation between the travelling state and the breach and leap events.

BE34 Bryde's whales in Madeira Archipelago (NE Atlantic): Site fidelity and short-term individual associations

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Little is known about the residency patterns and social organization of balaenopterids, from which the Bryde's whale is among the least known species. In Madeira Archipelago, this species is generally present between June and November, being more abundant in the summer months. Here, we aim to analyse site fidelity and short-term individual associations among Bryde's whales, using a 13 years (2005-2017) photographic dataset based on 505 sampling occasions collected on board platforms of opportunity. A total of 39 well-marked individuals were catalogued based on high-quality photographs, with recaptures for 17 whales (corresponding to 44%). From these, 35% were animals with up to four recaptures, 35% from five to nine recaptures, and 30% with more than 10 recaptures, with a maximum of 16. Interannual presence occurred in 13 individuals, with a maximum of 13 years between the first and the last recapture of one individual (14 captures in four non-consecutive years). Associations between two (n=15) or a maximum of three animals (n=3) were recorded for 14 whales, excluding mother-calf pairs. Only four of these individuals (¯ 29%) were observed in association with others in more than one occasion, with two of them identified as females (observed with a calf at least in one occasion) and the two others of unknown sex. This could indicate a different pattern of association related to gender. Due to the fact that these four individuals were always recorded with different animals, these associations seem to occur on a short-term basis. This is the first study confirming long-term site fidelity to this region of the Atlantic. Due to its regular presence and to the fact that it is one of the main target species of the whale-watching industry, Bryde's whales should be taken into account when establishing future management conservation plans.

BE35 Social relationships and death-related behaviour in aquatic mammals: a review

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Some aquatic mammals appear to care for their dead whereas others abandon their young (dead or alive) when conditions are unfavourable. This incredible variety in behaviour suggests the importance of comparing and contrasting mechanisms driving death-related behaviours among these species. We reviewed 104 cases of aquatic mammals, 81 of cetaceans (Delphinidae, Balaenopteridae), 23 of non-cetaceans (Phocidae, Trichechidae, Otariidae) dealing with a death

event and we extrapolated 'participant' (age class, sex, relationship, decomposition) and 'social' characteristics (escorting, calf dependence, alloparental care, herding, dispersal patterns) from published and unpublished literature. A Multiple Correspondence Analysis (MCA) was then performed to explore the relationships between these characteristics and death-related behaviours, with species clustered based on MCA scores. Results showed that both cetacean and non-cetacean species deal with death but they choose different behaviours to display it. Non-cetaceans characterized by a short maternal investment, touch and protect the dead alone while cetaceans spent much longer with their offspring and display carrying-(hauling, spinning, mouthing with the carcass, diving with it) and breathing-related (lifting and sinking the carcass) activities with the dead generally in association with other conspecifics. This study provides an initial exploration of how aquatic mammals deal with death and a synthesis of what kind of death-related behaviours are associated with certain social characteristics. However, more cases are needed to produce more firm conclusions. Presenting this first review on death-related behaviours among aquatic mammals we hope to encourage a larger number of researchers to report and discuss this topic in order to improve our understanding of grieving, abandonment and neglect among these species.

BE36 Social network analysis of killer whales (Orcinus orca) of the Falkland islands

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Killer whales (Orcinus orca) are a charismatic top predator species with a worldwide distribution. A notable aspect of killer whale biology is their complex sociality, based on a dynamic and hierarchical social system, and on long-term bonds between related individuals. Social network analysis (SNA) is a new and powerful tool to study complex social systems In 2013 we begun a long-term study of killer whales at Sea Lion Island, a hotspot of killer whale sightings in the Falkland Islands. We collected killer whale association data during observation periods carried out from land, using standard sampling techniques. We found that: 1) the basic social unit of Sea Lion Island killer whales is the mother-calf association, that can include up to four generations of calves; 2) multiple mother-calf pairs can be associated in pods, that are stable social units that last at least for the whole length of the season (September-March); 3) different pods, and non pod individuals, are sometimes associated together, in particular during predation events, that can involve up to 11 individuals; 4) transient killer whales, i.e. individuals that are observed at Sea Lion Island for just a few hours to a few days, can be associated to resident individuals; 5) within each social unit, short term association between specific individuals is variable in time and space, but shows repeatable patterns, that points toward specific social preferences of the different individuals; 6) some individuals show specific social skills, and can act as recruiters of new killer whales. A current development of the project is the study of association in videos taken from a drone. Preliminary results show that the full association pattern that can be observed in the drone videos can be quite different from the partial association pattern than can be observed at the surface.

BE37 The role of kinship in the sociality of herring-eating killer whales (Orcinus orca) in Iceland

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Among killer whales, kin mediated sociality appears universal and in general basic social units are matrilineal, composed of mothers and their descendants both male and female. In specialist 'resident' and 'transient' populations in the Northeast Pacific, philopatry is thought to promote stable foraging traditions by knowledge transfer within matrilineal units. Icelandic killer whales feed upon herring, a schooling prey that undergoes frequent changes in distribution and school size. Recent studies have shown that unlike specialised populations described elsewhere, in Iceland there appears to be variation in movement patterns and isotopic niche among killer whales that feed upon herring opportunistically, or specialise on it either seasonally or year-round. We combined photo-identification with genetic data to understand the sociality and the role of kinship in this population. Individuals sighted in at least 5 different days (n=198) were considered associated if photographed within 20s of each other. Photo-identified individuals were genotyped (n=61) for 22 microsatellites and mitochondrial DNA control region (611 bp). The population showed non-random associations and fission-fusion dynamics at the individual level. Some sets of individuals displayed seasonal preferential associations. Social clusters were highly diverse and while kinship was correlated with association it was not a prerequisite for social membership. Indeed, some cluster members had different mitochondrial haplotypes, representing different matrilineages. Individuals with different movement patterns were genetically distinct, but associated with each

other. No sex-biased dispersal or inbreeding was detected. This study reveals that the Icelandic population has a society where kinship drives social structure less strongly than in 'resident' fish-eating populations. We hypothesize that effective foraging on herring promotes the formation of flexible social groupings, which might include non-kin. The contemporary herring distribution promotes geographic overlap and social mixing of individuals with diverse movement patterns but the philopatry of both sexes maintains genetic structure despite probable constant gene flow.

BE38 The relationship between prey availability and consumption by harbour porpoises *(Phocoena phocoena)* in the southern North Sea

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The harbour porpoise (Phocoena phocoena) is the most abundant cetacean in the North Sea; its diet is varied and includes commercial fish species. The recent distributional shift of harbour porpoises within the North Sea is thought to be linked to food availability. However, information on the relationship between porpoises and their prey is largely lacking, emphasising the need for research on porpoise feeding ecology. A functional response provides insight into prey 'preference' and predation pressure. This study modelled a Multi-Species Functional Response (MSFR) to describe the relationship between prey availability and consumption by harbour porpoises within the southern North Sea. Stomach contents from stranded porpoises along the Dutch coastline were used to estimate consumption and select 'main' prey species. The area where porpoises may have foraged prior to stranding was estimated by linking the likely time frame of the most recent feeding to predicted swimming speeds from Danish telemetry data. Fish survey data were used to generate distribution models to estimate prey availability. Bayesian methodology was employed to estimate MSFR parameters and to incorporate uncertainties in diet and prey availability estimates. Two models were compared: the shape of the functional response was either hyperbolic (Type II) or sigmoidal (Type III). The diet of harbour porpoises is diverse and switching behaviour between prey species was confirmed by the favoured Type III functional response model. Therefore, some prey species might be vulnerable to 'predator pit' effects. In this area porpoises seemed to have a strong 'preference' for sandeels, and the availability of sandeels might therefore have a particularly marked effect on porpoise consumption of other prey. Further work is needed to increase the reliability of the predictions by examining how resilient the results are to different assumptions about the area associated with porpoise foraging prior to stranding.

BE39 Shifting foraging habitats of Mediterranean fin whales identified by behavioural data on fine scale and long-time period

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The Pelagos Sanctuary (NW Mediterranean) is known as a crucial summer feeding ground for fin whales (Balaenoptera physalus). Although several studies investigated the species' habitat uses, most of them refer to short-time periods and rely only on presence data, without taking behaviour into account to discriminate foraging animals. Aiming to investigate the variability of foraging sites on a finer scale, we analysed an unprecedented long time series of samples, spanning over 18 years (2000 - 2017). In the Sanctuary fin whales feed at depth; however foraging behaviour can be identified through their surface swimming patterns. Previous studies proved that research vessel tracks may be used as proxy for the whales' swimming patterns. 237 about 30-minutes vessel tracks, collected during summer surveys, were analysed. The 2002-2017 time series of area-averaged, May-September, chlorophyll-a patterns derived from MODIS Aqua sensor (4 km monthly normalized fluorescence line height) was investigated through Cluster Analysis in order to identify years with homogenous chlorophyll patterns. In a preliminary step, a Principal Component Analysis was applied to a set of track descriptors, allowing to select components (velocity, track length, linearity, sample duration) explaining 70.0% of the original variance, and which were later used as input for a hierarchical Cluster Analysis (CA). Based on CA, two main clusters were identified as foraging (61.6%) and non-foraging (38.4%) tracks. Foraging sites showed significant shifts in mean longitude (average 43.5 km, max 87 km) among years (Kruskal Wallis H, $p<0,01$) and among the clusters of primary productivity deriving from the analysis of chlorophyll data. Apparently fin whales actively respond to dynamic changes at both spatial and temporal scale. In order to support conservation measures, further investigation on fine scale, based on the whales' behaviour, should be conducted on a wider area, and could be a useful integration to existing large-scale models.

BE40 Cultural transmission in humpback whales: insights from song hybridisation events during revolutionary song change

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Cultural processes occur in a wide variety of animal taxa, from insects to cetaceans. The songs of humpback whales are one of the most striking examples of the transmission of a cultural trait and social learning in any nonhuman animal. To understand how songs are learned, we investigate rare cases of song hybridisation, where parts of an existing song are spliced with a new one, likely before an individual totally adopts the new song. Song unit sequences were extracted from over 9,300 phrases recorded during two song revolutions across the South Pacific Ocean, allowing fine-scale analysis of composition and sequencing. In hybrid songs the current and new songs were spliced together in two specific ways: (i) singers placed a single hybrid phrase, in which content from both songs were combined, between the two song types when transitioning from one to the other, and/or (ii) singers spliced complete themes from the revolutionary song into the current song. Sequence analysis indicated that both processes were governed by structural similarity rules. Hybrid phrases or theme substitutions occurred at points in the songs where both songs contained "similar sounds arranged in a similar pattern." Songs appear to be learned as segments (themes/phrase types), akin to birdsong and human language acquisition, and these can be combined in predictable ways if the underlying structural pattern is similar. These snapshots of song change provide insights into the mechanisms underlying song learning in humpback whales, and comparative perspectives on the evolution of human language and culture.

BE41 Assessing reproductive parameters of females bottlenose dolphin (Tursiops truncatus) from the Aeolian Archipelago (Southern Italy): a thirteen-year mark-recapture study

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A thirteen-year (2005-2017) mark-recapture study was performed on a small bottlenose dolphin population in the Aeolian Archipelago (Italy) (Blasi & Boitani, 2015, 2014, 2012). Resident dolphin groups associate in this area during the breeding season and females with calves have strong associations preferring habitat for reasons associated with social behaviour, resting or calving. In this study, the reproductive trend of female dolphins was investigated by photo-identification analyses. The number of reproductive females in the population and their occurrence in the study area, the breeding season (pregnancy/birth periods for reproductive female), the group size, the productivity (number of calves for each reproductive female), the interval between births, the weaning period, the calves mortality and the permanence time of individuals in the kin group were assessed. A total of 42 individuals were photo-identified, of which 47.62 % classified as resident (n=20), 14.28 % as frequent (n=6), 38.1 % as occasional (n=16) dolphins. The average (± St. Dev.) group size for females and calves groups was 8.01 (± 4.25). The encounter rate of female groups was rapidly decreasing ($p < 0.001$). The breeding season was the summer from April to September. Seven reproductive females produced totally 16 calves. The productivity (from 1 to 4 calves) and interval between births (from 2 to 8 years) varied among females. A weaning period from 2 to 4 years was estimated. Two calves dead during the study period. The permanence time in the kin group was estimated for only 2 individuals sighted the first time with the mother and re-sighted as juveniles/adults and it was 8 and 9 years, respectively. Our results suggested that this population is strongly endangered and urgent management actions are needed to increase the reproductive success and protect this important breeding area for bottlenose dolphins.

BS BYCATCH & STRANDINGS

BS01 Entrapments of cetaceans in stationary pound nets in Black Sea waters of the southern Crimea

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Cetacean interactions with fishing gears are a worldwide-scale problem. The main source of incidental mortality for cetaceans in the Black Sea is gillnet fishery, but little is known about the impact of pound nets. Stationary pound nets are widely used in coastal waters of the Black Sea, including Crimea, and a few nets are operating near Balaklava, catching various fish species. The nets in Balaklava are 30-60 m long and 10-20 m wide; the mesh sizes are 0.8-1.2 cm and 1.4-1.6 cm. Since 2011, sporadic coastal and boat visual observations of cetaceans were conducted in the waters adjacent to

Balaklava. Also, we interviewed fishermen who maintained the pound nets. In April and May 2012, feeding of harbour porpoises (HP) in the pound nets was observed twice: 2 and 3 individuals (1 calf); also, fishermen reported about other cases. In June 2017, large aggregations of horse mackerel were observed in coastal waters of the northern Black Sea (including the Balaklava area) which caused the increase in the occurrence of all the cetacean species. On June 9, there were 3 bottlenose dolphins (BD) and at least 4 HP seen simultaneously in the same pound net, and a HP in another one. On June 14, 2 BD and at least 12 HP were observed simultaneously in the same net for several hours. Fishermen operating the net reported there were unusually frequent cases of entrapments in 2017, and a common dolphin was incidentally caught. Usually, they had to drive out cetaceans from the nets: animals almost never could escape without help. Sometimes cetaceans stayed in the nets for hours, and such multiple and multispecies entrapments could harm them or even cause death. The effect of interactions with pound nets on the Black Sea cetacean populations needs to be assessed to minimize adverse anthropogenic impact.

BS02 30 years of activity of the Italian stranding network

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The monitoring and the scientific study of marine mammal strandings is a key activity for the management of the marine environment within the framework of the EU Marine Strategy Directive. The Italian Stranding Network was created in 1986; 20 years later, in 2006, the National Stranding Data Bank was created and made available online by the University of Pavia and the Natural History Museum of Milan on behalf of the Italian Ministry of the Environment. The online data bank collects and validates stranding data to be made available online to Governmental and Research Institutions as well as to the general public. The Data Bank, online at the address **http://mammiferimarini.unipv.it**, holds the data published by the Centro Studi Cetacei in years 1986 – 2006 and, since 2005, it is updated in real-time with data sent by the Italian Stranding Network. In the period 1986 to 2017, 5133 stranding events have been recorded, totaling 5251 stranded animals belonging to 14 species. The real-time monitoring of the collected data allows to alert authorities and scientists any time anomalous events are evidenced.

BS03 Take it or leave it: how and why respond to live-stranded beluga neonates

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A population of beluga lives in the St. Lawrence Estuary (Canada) isolated from their northern neighbours. Estimated at fewer than 900 individuals, their number decline of 1,5% per year since early 2000s. Neonate mortality has increased from a median of 1 reported case per year (1983-2007) to a median of 7 since 2008. A comparable increase in the mortality rate of females in perinatal conditions was observed during the same period. Along with these increases, the number of live-stranded neonates jumped from 0,2 to 0,7 per year. The first two live-stranded neonates were transported to aquariums but did not survive. The following three were euthanised. In 2008, we attempted a first neonate relocation in a female and young herd that could potentially adopt it.. Seconds after release, the neonate was joined by adults and accompanied for several hours before visual contact was lost. The outcome of this intervention remains uncertain. Since, two other relocations without prerelease treatment or post-release telemetry have been attempted, neither of them with a known outcome. In this communication, we review various decision trees and ethical frameworks to sort out future intervention options: let nature take its course; euthanasia; relocation with or without prerelease treatment; transfer to aquariums with or without the option to return to the natural environment. Whereas these frameworks invoke several ethical domains, from normative ethics to animal rights, including research and environmental ethics, they all need data and evidence. At present, based on an extensive review of rescue and release attempts in US waters, NOAA guidelines determine nutritionally and socially dependent odontocetes calves non-releasable. None of the reviewed cases included neonates. We propose to pursue beluga neonate relocation attempts with improved prerelease health assessment and post-release tracking protocol to gather new data on adoptions and better inform future decision-making.

BS04 Evidences of predation and scavenging by large predatory sharks upon specimens of striped dolphin *(Stenella coeruleoalba)* and short-beaked common dolphin *(Delphinus delphis)* stranded in the coast of Southern Sardinia

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Predation by large predatory sharks represents a rare albeit documented natural mortality factor affecting marine mammals in the Mediterranean Sea. Moreover, opportunistic foraging by elasmobranchs on cetacean carcasses is occasionally reported in stranding records. Centro Recupero Cetacei e Tartarughe Marine (CRCTM) Laguna di Nora operates through the network Rete Regionale per la Conservazione della Fauna Marina under the Assessorato Difesa dell'Ambiente of the Regione Autonoma della Sardegna authority. Since 1993, CRCTM core mission consists in monitoring, rescue and conservation of cetaceans and sea turtles of South-western Sardinian coasts. During CRCTM activities, three events of striped dolphin (Stenella coeruleoalba) and short-beaked common dolphin (Delphinus delphis) interactions with large predatory sharks were investigated. The first case occurred on 25th October 2011 in Fradis Minoris peninsula of Nora, Pula (Lat. 38° 59' 11,1"; Long. 9° 00' 22,1"). Record relates to the finding of a fresh-stranded, striped dolphin juvenile anterior half-body portion (maximum length from rostrum tip to mid-flank margin ~ 55 cm). Carcass examination indicated recent predatory activity by a large shark that, based on dimensions and morphology of the bites and size of teeth traces, was ascribed to a great white shark (Carcharodon carcharias). The second case occurred on 6th January 2017 in Funtanamare, Gonnesa (Lat. 39° 17' 22.8"; Long. 8° 26' 13.5"). Two striped dolphin juvenile females (TL 180 cm and 142 cm) were found stranded in moderate decomposition, one showing bites on the dorsal region inflicted by a large shark, most likely a lamnid. The third case occurred on 3rd February 2018 in Spalmatore, Carloforte, San Pietro island (Lat. 39° 06' 53.1"; Long. 8° 15' 18.8"). A short-beaked common dolphin adult male (TL 193 cm) was stranded with several bite wounds from a lamnid shark. Hypothesis for predation and/or scavenging and predator species putatively involved in the events are presented.

BS05 Stranding records of Cuvier's beaked whale, Ziphius cavirostris on the coast of Turkey and Northern Cyprus, 2016-2017

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The presence of beaked whales is mostly known through stranding records in the world oceans including the Mediterranean Sea. Five strandings of Cuvier's beaked whale Ziphius cavirostris were observed and reported along the coast of Turkey and northern Cyprus in 2016 and 2017. The first specimen (male, body length: 526 cm) was live stranding in Gökova Gulf, the Aegean Sea, on 3 June 2016. The second specimen (male, 510 cm) found stranded on Seferihisar, the Aegean coast, on 5 June 2016. The third specimen (male, 472 cm) was found in Yakacik, Gazipasa, the Mediterranean coast, on 20 June 2016. These individuals were misidentified as Mesoplodon mirus at first, later corrected based on the morphological and genetic analysis. There was an additional stranding on the island of Chrysi (south of Crete) on 16 June 2016 as reported by media. The forth (female, 400cm) was found stranded on Çatalköy, North Cyprus, on 30 March 2017. The fifth individual stranded (male, 479cm) in Çamyuva, Antalya, on the Mediterranean coast, on 14 November 2017. The reason for the first three strandings as well as one on Crete in June 2016 was not prominent but they can be related to military activities which took place in the eastern Mediterranean-Aegean region in the same period. The northern Levantine Sea and precisely between the Anaximander Seamounts, Antalya Canyon, and Adana Trough, is considered to be an area of importance for the distribution of Cuvier's beaked whales.

BS06 Investigating the occurrence of marine debris in stranded whales and dolphins in the Netherlands

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From December 2012 till December 2017, the stomachs and intestinal contents of stranded whales and dolphins in the Netherlands were investigated on the presence of marine debris. Due to the lack of dedicated protocols to investigate marine debris ingestion in previous studies this study tries to find the best way to investigate marine debris (macro and micro) in whales and dolphins. Stomachs and (parts of) intestines were collected during the necropsies on the beach or at the pathology division of Utrecht University. A total of 26 stomachs and 23 intestines were collected from 32 stranded cetaceans, comprising eight species: 1 humpback whale, 1 bottlenose dolphin, 5 Sowerby's beaked whales, 9 sperm whales, 4 fin whales, 4 common dolphins, 3 long-finned pilot whales, 2 minke whales and 3 striped dolphins. Stomach

and intestinal contents of large whales, were washed using a series of 1x1 m sieves, with 1.0 mm and 0.5 mm mesh size. Obtained sieve fractions were machine-washed (following published procedures) to collect marine debris and hard prey remains. For dolphins an overflow method was used to collect hard prey remains and marine debris. Marine debris was found in the stomach of two sperm whales, and in intestinal content of two additional animals; a Sowerby's beaked whale and a humpback whale.

BS07 Ship strikes in large whale: an overview of the Italian situation

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Ship strikes are considered as one of the major threats for large whales in the Mediterranean Sea. Bows of fast ferries and propellers of large vessels could injure these animals while swimming, often leading them to death. In order to understand the real impact of collisions, large cetaceans carcasses found stranded along the Italian coastlines were constantly investigated through complete postmortem examinations, but only since 2006 forensic investigations were used to confirm the cause of death. This approach is based on microscopic investigations (i.e. research of fat emboli in the lungs and/or immunohistochemical analyses) aimed to assess the vitality of the reported injures. Between 1986 and 2017, 25 whales out of the total 272 (9,2%) were reported as possible victims of ship strikes based on necropsy findings. More in details, 16/87 (18,4%) fin whales (Balenoptera physalus), 1/4 (25%) minke whales (Balaenoptera acutorostrata) and 8/181 (4,4%) sperm whales (Physeter macrocephalus) showed gross traumatic evidences consistent with an incident. Most of these strikes were geographically clustered in the Pelagos Sanctuary and in the Southern Thyrrenian Sea. Despite these large numbers, since 2006 the applied forensic approach confirmed a strike in 2/25 fin whales (8%) and 1/52 sperm whale (1,9%). Since the final diagnosis in this period was based on the confirmation through microscopic techniques, the marked reduction of the ship strikes incidence could be related to an overestimation before 2006 as well as the impediment to hypothesise a final cause of death due to the large number of badly preserved carcasses not allowing these examinations. Necropsies on these animals, conducted in order to preserve skeleton for museum exposition, revealed traumatic injures occurred to the bones of these animals. These remains will be prepared for public display of this menace for large whales conservation.

CS CITIZEN SCIENCE

CS01 Partnership with public as the important component of the cetacean stranding registration and monitoring network in recreational region

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The cetacean stranding registration and monitoring network developed in the Crimean peninsula in 2017 allowed to obtain data on 225 animals stranded on the Black Sea coast in period April – September. Only 8 animals were found as a result of the target monitoring of the Southeastern Crimean coastline part. Data on the majority of the stranded animals' (217) were obtained from 172 public communications - as from local population as from tourists. Appeals to inform about stranded cetaceans were placed in internet-sites and social networks. Responding to the messages 27 animals were researched by the network specialists. Comparing data of the public communications regarding Sudak area coastline length of 30 km (22 stranded animals) and data of our target monitoring of the same coastline (7 animals) we see clear "quantitative" advantage of the one. At the same time, quality of data is limited. Public distinguish animals with elongated rostrum (bottle-nosed dolphin or common dolphin) from animals with short rostrum (harbour porpoise). To distinguish bottle-nosed dolphin from common dolphin becomes possible when the communications are accompanied by photo (72% of the messaged in our case). Data received from the public do not allow to identify sex and age (it is possible to identify whether an adult or calf approximately). From other side, the people report details about circumstances of the stranding including external signs of by-catch if any. In case of photo the by-catch case is confirmed reliably. We conclude public registration component of the network in recreational region in warm season allows receiving much more data on stranded animals than monitoring of coastline; photo improves the data significance. Due to limitation of the quality of data the communications should be followed by the network specialist field trips. In cold season the role of the public component decreases, but the monitoring one increases.

CS02 Whale Track; Crowdsourcing for marine mammal conservation

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Whale Track is a marine mammal sightings platform developed by the Hebridean Whale and Dolphin Trust (HWDT) in partnership with Natural Apptitude to crowdsource effort based sightings data on the west coast of Scotland. This new infrastructure is a development of HWDT's well-established Community Sightings Network that has been collecting effort based and incidental sightings from across the region since 2001. Over 10,000 records have been submitted, but until now the number of users that could collect effort based sightings data was restricted to those that could have a laptop connected to the vessels navigation system. The advent of new innovative technologies and the widespread ownership of internet-enabled devices has allowed many projects to use citizen scientists to collect data and engage with the scientific process. Capitalising on these technological advances, the Whale Track smartphone application (app) was developed to record both effort based and opportunistic sightings data, making it quicker and easier for contributors to report their sightings. The app uses GPS to record sightings effort and the location of sightings, alongside user-friendly forms to collect additional information about the excursion, environmental conditions and sightings. The information is stored locally on the handset and uploaded to an online server, once the user has cellular coverage or WiFi. Trained researchers then process the data. Since its launch in August 2017, 279 people have registered submitting 1,405 sightings of 11 cetacean species. One hundred and eighteen effort related excursions have contributed 5,578 km of on effort survey during nearly 1,000 hours spent at sea, with 61% of the data from wildlife operators. Through this project, people across Hebridean communities are taking an active role in cetacean research providing critical year round data on the occurrence and distribution of cetaceans contributing towards marine mammal conservation.

CS03 1000 eyes: how to multiply eyes for sightings involving stakeholders

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During the year 2017 an educational project on monitoring cetaceans and sea turtles in the Gulf of Trieste (Italy, North Adriatic Sea) creating a sense of stewardship in people involved, was coordinating by DelTa association. In order to cover the study area and multiply the efforts for sightings, different groups of stakeholders were trained and strategic partnerships with institutions to a higher level of effectiveness were signed: the ferry boat company that operate in the Gulf to be hosted on the vessel; several high schools and local University were fundamental to have students-researchers aboard the platform; the local Coast Guard for reporting us sightings and/or strandings; the Regional Agency for the Protection of the Environment (ARPA) to have our researchers on their scientific vessels; the Regional Veterinarian Service for a shared protocol in case of stranding and first aid. After an appropriate training, 40 students of 16 years of age were selected and in small teams of 6 people each were involved in a monitoring of cetaceans, turtles and marine macro litter twice a week from June to August on the ferry touristic line Trieste-Grado and return. At the same time the crew of the ferry company was trained to send us useful information when neither the students nor DelTa researchers were present aboard. A citizen-science involvement with the passengers during the surveys was useful to raise awareness. 2 sightings of bottlenose dolphins were observed during the 13 days of monitoring covered by the students while 6 sightings were documented by the crew, 4 by DelTa researchers aboard the ferry boat, 1 by the ARPA researchers. In the end all these stakeholders actively reporting sightings, often supplied by pictures or videos, contributing to our database.

CS04 It takes a village: Using citizen science to expand monitoring of individual long-finned pilot whales along the coast of Cape Breton Island, Canada

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The cost of studying highly mobile free-ranging cetacean species is often a hindrance to research effort, especially for populations that are lesser known and do not represent an immediate conservation concern. Citizen science has helped with the monitoring of species such as killer (Orcinus orca) and humpback whales (Megaptera novaeangliae), but presents more of a challenge with less charismatic cetaceans. Working with whale-watching companies operating off Cape Breton Island, Nova Scotia, Canada we have been able establish a secondary monitoring program for a population of long-finned pilot whales (Globicephala melas) that spends the summer and autumn months in Gulf of the St. Lawrence waters. This study compares photographs taken by our field research team out of the port of Pleasant Bay (n=22,342) and a full-time naturalist working approximately 35km to the northeast out of the port of Bay St. Lawrence (n=8,220). Both locations had coverage on 46 days during July and August in 2017, with teams having similar on-water schedules and overall research effort. Photographs have been quality rated, with Finscan being used to match individuals within

a season and between field sites. Both the re-sighting rate and the time lag between sightings of individuals will be investigated to look at the movement of whales between study areas. This research demonstrates how dedicated citizen science contributions can be a useful and cost-effective means of expanding research effort – especially when monitoring coastal wide-ranging cetacean populations, while also furthering conservation through the strengthening of partnerships with local stakeholders, such as whale-watch operators and local communities.

CS05 Introducing England's only resident population of bottlenose dolphins: Using citizen science data to assess the social structure, residency and abundance of the southwest community

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Bottlenose dolphins (Tursiops truncatus), have been seen regularly in the southwest region of the UK since 1991. However, the degree of residency and abundance of this population remains poorly understood. In this study, citizen science data collated from key organisations and individuals was used to analyse the social structure, site fidelity and abundance of bottlenose dolphins in the southwest in order to provide recommendations for their conservation. A total of 193 photo-identified encounters from 2008 to 2016 were acquired from various sources throughout the southwest region. Evidence for a discrete coastal community restricted to waters < 50 m is presented, along with the existence of other pelagic animals and lone individuals who appear to be spatially and behaviourally segregated. Site fidelity and social organisation for the coastal community was assessed, showing moderate to high levels of site fidelity, and a moderate mean half weight association index (0.24). Hierarchal cluster analysis identified three subgroups within the coastal community, though kernel density methods demonstrated that each social group had an overlapping range, with two distinct core areas of use. Ranging behaviour demonstrated that individuals within the coastal community travelled appreciable distances and were not confined to the core areas. Seasonal residency indicated that dolphins within the coastal community are year-round residents, with an increase in sightings during the summer. The combination of these findings provides strong evidence that a resident coastal population of bottlenose dolphins occur in southwest England. Mark–recapture analysis estimated 28 individuals within the resident population (24 -32 95% CI). It is therefore clear that this population requires specific measures of protection, such as the designation of a Special Area of Conservation (SAC) or Marine Conservation Zone (MCZ) in southwest waters.

CS06 Cetaceans of South-Western Crimea: revised polling materials

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Coastline between Sarych and Chersonese Capes occupies about 40 km. It is extreme Southern and Western edge of the Crimean Peninsula, containing many habitats of biodiversity, a number of MPAs, fish-cetacean migration paths, sites of cetacean stocks concentration in winter. At the same time it is a place of mainly uncontrolled recreation, backpacking, and intensive marine fisheries. Cetaceans occur in coastal waters all year round; so this narrow seashore strip is one of the most preferable ecosystems for observations on their geographical, annual and seasonal distribution, specific structure, migrations and strandings, as well as existing trends definition. The analyzed material was obtained from polling of 3693 university and college students, local people and specialists in forestry and hunting in 2002-17, and field excursions in 1997 and 2015 (240 of respondents are residents of this region, the others visit it regularly); 164 sightings and 57 strandings were reported. The most of sightings observed in Balaclava sea area (32.5%) and near Fiolent (22.1%) and Sarych Capes (7.1%), and also in Laspi sea area (10.4%), near Aya Cape (10.0%), Batiliman coast (7.1%), Sevastopol outer sea area (6.5%), and Chersonese Cape (5.2%). Harbour porpoises (50.9% of identified cases), bottlenose dolphins (38.2%) and common dolphins (10.9%) occurred mainly in summer (78.0%), but also in spring (11.0%), autumn (7.0%), and winter (3.0%). Winter sightings were registered near Fiolent and Aya Capes, and Balaclava more frequently than in other areas. The annual peaks of cetacean occurrence correlated with fish migrations – in 2003 (10.4%); 2006-2008 (7.1-7.8%), and 2011 (13.0%). Bottlenose dolphins and harbour porpoises (46.9 and 40.6% of identified cases) dominated in strandings; they were located mostly in Chersonese Cape (29.8%), Balaclava sea area (28.0%), and Fiolent Cape (17.5%). The highest level of strandings coincided with 2002 and 2005 (in 10.5%), 2006 (14.0%), and 2011 (12.3%).

DA DENSITY & ABUNDANCE

DA01 Cuvier's beaked whale photo-identification off North-Eastern Sardinia (Caprera Canyon, central-Western Tyrrhenian Sea): preliminary results on site fidelity and population size

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Although Cuvier's beaked whale (Ziphius cavirostris G. Cuvier, 1823) is considered common in the Pelagos Sanctuary (NW-Mediterranean Sea), its IUCN conservation status is still "Data Deficient" for the Mediterranean subpopulation. One of the reasons for the lack of knowledge on the species is the difficulty to spot and approach these elusive cetaceans at sea, resulting in very few photo-ID studies. Stranding and sighting data indicate that this species is regularly occurring in the central-western Tyrrhenian Sea. This work aims to achieve a first rough estimate of Z. cavirostris population size in the Caprera Canyon system, using mark-recapture methods. We analyzed a photo dataset collected between 2011 and 2014, during a still ongoing long-term study. A total of 81 sightings of Z. cavirostris were recorded, photographic data were collected in 54 of these, and resulted in a database of 256 records, including captures and recaptures. Based on natural marks, a total of 65 individuals were identified within the Caprera Canyon system, with a resighting rate of 42.2%. Maximum interval between individual resightings was 4 years (1075 days). Individuals recaptured at least once were 26.5%, twice 9.37%, and three times 9.37%. These data show some degree of residency and site fidelity of Z. cavirostris to the study area. The population size estimate ranged from 108 (95% C.I. = 74 - 171) to 105 (95% C.I. = 70 - 177) using left and right side marked individuals, respectively. The preliminary total population size is estimated to be 116 individuals, including unmarked individuals. Results confirm the evidence of the study area as a favourable habitat for Z. cavirostris in the Mediterranean Sea. Moreover, the recent identification of the Caprera Canyon as Area of Interest (AoI) highlights the need of further long term research effort and proper protection measures for the conservation of this species.

DA02 Are bottlenose dolphins *(Tursiops truncatus)* increasing in the North–Western part of the Pelagos Sanctuary (Mediterranean Sea)?

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Tethys Research Institute's long-term project operates in the Western part of the Pelagos Sanctuary (Ligurian Sea) since 1990, monitoring an area of approximately 24,000 km2. Between 1990 and 2017, a total of 67 sightings of bottlenose dolphin were recorded, mostly occurring at depths of 200-280 m and at a distance of 2-7 nautical miles from the coast. In recent years a relative increase of the species encounter rates (ER: number of sightings/effort km) have been observed (ER 1990-2000 = 0.0004; 2000-2010 = 0.0005; 2010-2015= 0.001; after 2015 = 0.002), suggesting that bottlenose dolphins are using more frequently these waters. Aim of this study is to have a first estimation of the bottlenose dolphin abundance in the area. Photo-identification has been conducted regularly during summer season from 2006, resulting in a total of 130 catalogued individuals with long-term recognizable markings. Bottlenose dolphin abundance was estimated through mark-recapture methods focusing on the period 2014-2017, only on 86 well marked individuals (approximately 80% of the total) considering the field season as primary sampling period and monthly or bimonthly units as capture occasions. Different models assuming a closed population were used proving abundance estimates in the range of 47-81 individuals (95% CI range 50-150). No estimates were possible for the seasons before 2014 because the number of captures was too low. These preliminary results show that bottlenose dolphin population might be big enough to compete with other species regularly occurring in the area (e.g. striped dolphin). Further investigations will shed light on the habitat use, and possibly the partitioning of this species with the other cetaceans inhabiting the area, and will improve our understanding about the causes and potential implications for the whole ecosystem of the species increase.

DA03 Abundance assessment of sperm whales (Physeter macrocephalus) in the North-Western portion of the Pelagos Sanctuary (NW Mediterranean Sea)

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The Mediterranean sub-population of sperm whales is classified as 'Endangered' on the IUCN Red List. No estimate

of population size currently exists for the Mediterranean region, while abundance estimates are available only for some areas. Aim of this study is to assess the size of sperm whale population using the North-Western portion of the Pelagos Sanctuary area in the summer period, through mark recapture (MR) methods. Accordingly, a combined photo-identification dataset was created by merging the catalogues owned by Tethys Research Institute (TRI) and CIMA Foundation (CIMA), both operating in the North-Western part of the Pelagos Sanctuary, covering an area of approximately 30,000 Km2. Out of 356 sightings (n= 326 TRI; n= 32 CIMA), collected between 1990 and 2014, a total of 136 different individuals were identified based on fluke markings. Individuals sighted more than once, up to 18 times, represented the 60% of the total captures. 20% of the resightings occurred within the same season but many individuals were resighted across different seasons (50 %). The longest interval between two resightings was 11 years. Data were pooled based on the homogeneity of the photographic effort. Abundance estimates were calculated based on both closed and open population models. For closed population models, the field season and the bimonthly unit were chosen as primary and secondary sampling interval, while open population models concerned a three years' sampling interval. Although in recent years, sperm whale encounter rates were documented to increase in the area, open population models suggest instead a stable population in the range of 43-56 individuals (CV=0,40) showing an high site fidelity. MR analysis confirms that the Pelagos Sanctuary is a critical area for the species, although further investigations are needed to improve the understanding on sperm whale habitat use and on how it correlates with environmental variability.

DA04 First line transect based abundance estimate of spotted dolphin in Canary Islands in the framework of MISTIC SEAS 2 project

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The european Mistic Seas I project was initiated in the 2015 in the Macaronesia Northeast Atlantic sub-region, with the objective to establish a common roadmap and to obtain baseline information for a better coordination and implementation of the Marine Strategy Framework Directive (MSFD, 2008/56/EC). MISTIC SEAS II, which is part of the second cycle of the MSFD, aims to implement joint programs between Spain and Portugal to monitor the status of marine mammals, sea turtles and seabirds in the Macaronesian sub-region. Spotted dolphin (Stenella frontalis) was identified as a common management unit (animals of a particular species in a geographical area to which management of human activities is applied), in the three macaronesian archipelagos (Azores, Madeira and Canary Islands), and used as tester to establish common methodologies for monitoring the marine biodiversity in the Macaronesia. Line-transect data from sighting surveys conducted in the Canary Islands between September and November 2017 were analysed to map the distribution and to estimate the abundance of spotted dolphins. During the 4,680 km conducted on effort, 257 cetacean sightings belonging, at least, to 12 different cetacean species were recorded, of which 74 were spotted dolphins. Distance sampling methods estimated abundance at 125,356 individuals (CV = 0.337, 95% CI = 65,469–240,025). Due to small sample size the estimate should be considered preliminary. Spatial modelling methods will be applied to the data in the near future. These results provide baseline values of abundance and up-to-date information on the status of this management unit feasible for comparison with future studies in the Canary Islands and within the other macaronesian archipelagos

DA06 A preliminary photo-identification study of the individual bottlenose dolphins using the Northumberland coastline in northeast England

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The Moray Firth in north-east Scotland (57°41' N, 02°20' W) contains the only year-round, resident population of bottlenose dolphins (Tursiops truncatus) in the North Sea. Studies in this region have been conducted since the late 1980s, and have greatly increased our understanding of these coastal delphinids and assisted in their management in Scottish waters. However, animals from the Moray Firth range far beyond the designated SAC area in Scotland throughout the wider, outer southern Moray Firth, along the Grampian coastline to Tayside and Fife and even further south to Northumberland in northern England, with individuals exhibiting a high degree of spatial and temporal variability in their distribution and movements. In this respect, a better understanding of the movements and fidelity of this North Sea bottlenose population throughout its range would be especially useful for informing impact assessments

concerning marine development and exploration activities along the northeast coastline. In the present study, photo-identification was used to investigate the occurrence and site faithfulness of individual dolphins utilising the Northumberland coastline, at the southern extreme of the population's range. Photographs collated from opportunistic encounters by tour boats in the northeast of England between 2013 to 2016 were analysed and matched against a long-term database of approximately 200 known individuals from this population. A first photo-identification catalogue for the Northumberland region was subsequently established, providing crude estimates of the number, composition and fidelity of the animals identified in this area, and informing on the spatio-temporal movements of known individuals between the northeast English coastline and the Scottish Moray Firth. This study potentially serves to increase our predictive power for potential consequences from ongoing development projects (such as wind farm installations and oil and gas activities) and fishing interactions affecting the animals utilising the southernmost area of the populations range.

DA07 Abundance of Commerson's and Peale's dolphins in inshore waters of the Falklands Islands estimated by aerial survey

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The near-shore waters of the Falklands Islands host resident populations of Commerson's (Cephalorhynchus commersonii) and Peale's (Lagenorhynchus australis) dolphins apparently relying on coastal kelp forests. Despite Commerson's dolphins having recently been assessed as Least Concern, information to evaluate population size following the IUCN Red List criteria are missing from large parts of the species' geographic range, including the Falkland Islands. Recent genetic analyses now indicate that Commerson's dolphins around the Falkland Islands are differentiated from populations along the South American continent and from the subspecies found around the Kerguelen Islands. Information for Peale's dolphin is still inadequate and the species remains listed as Data Deficient. Funded by the UK Government's Darwin Plus Funding scheme and the Falkland Islands Government, the 'Dolphins of the Kelp project aimed to estimate dolphin abundance within 10 km from the coast of the Falkland Islands. Aerial surveys were conducted during nine days from March to May 2017 using design-based line transect sampling techniques covering a survey area of 19,314km2. Survey design was generated using the software Distance 6.2 resulting in 217 parallel transects spaced at five and six km. Effort on transect was 4,327 km. Estimates of abundance obtained are: for Commerson's dolphins 5,499 (CV=0.16) individuals with a group size of 3.56, (CV=0.06, range 1-16) and Peale's dolphins: 2,336 (CV=0.31) individuals with a group size of 4.54 (CV=0.14, range 1-21). Potential issues pertaining to availability bias are currently being explored using drones footage of dolphin surfacing behaviour. Our dolphin density estimates for the Falkland Islands are substantially higher compared to recent aerial survey estimates for the Patagonian shelf. This project provides valuable baseline data to evaluate population trends, contributes to the IUCN Species assessment and the Falklands Species Action Plan, as well as ongoing initiatives targeting sustainable use of ecosystem services.

DA08 Occurrence of fin whale *(Balaenoptera physalus)* in the Azores archipelago: assessment on its migration behavior and first photo-ID catalogue of the area

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The fin whale (Balaenoptera physalus) is one of the most abundant baleen species in Azorean waters. Here we present the first photographical identification (photo-ID) catalogue of this species that occur regularly across the waters of this area, particularly during the spring season. A six-year study, making use of the practice of whale watching, allowed the opportunity to collect new data on fin whale ecology. For each sighting, we collected data on behavior, geographical location, response to boat presence, and photo-ID. In a total of 488 sightings, 933 putative individuals were seen. The main observed behaviors were: travelling (48%) and foraging (29%). Considering the response to boat presence, individuals were largely indifferent (84%) and approached the vessel (11%). A total of 845 images used for photo-ID of porpoises were taken. All images were sorted according to quality criteria (from Q1 to Q5) and only images with a minimum quality of Q4 were used, generating a total of 420 photo-ID images. Through the photo-ID assessment: 214 different individuals were identified, 5 individuals were matched between years and the longest period in a year during which a whale stayed in the same area was 28 days. This first approach shows that fin whales are quite abundant in spring time during the migration from breeding to feeding grounds. Our data also confirm that the whale watching boat presence doesn't affect the natural behavior of the species. Furthermore, it seems that the seasonal presence of krill in the area attract individuals on an annual basis. It is possible that the Azorean waters act as a corridor for baleen

whales. We propose that further studies should focus on better understanding how baleen whales in general, and fin whales in particular, use oceanic islands during their migration.

DA09 ObSERVE-ACOUSTIC: Sperm Whale Density and Abundance in Western Irish Waters

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The offshore Atlantic waters west of Ireland are subject to increasing levels of human activity. To provide the information on cetacean populations required for management, strategic partnerships between Irish Government departments and between research groups were established. Western Irish waters are a challenging environment in which to conduct shipboard surveys and many of the species of interest are deep-divers that spend little time at the surface. Using acoustic methods to detect cetaceans greatly improves the effectiveness of shipboard surveys. Towed array data can be used to determine presence and an index of relative abundance for many odontocetes, while, for sperm whales, absolute abundance can be estimated. Because sperm whales produce characteristic click trains which can be detected at ranges of many miles, the locations of individual whales can be estimated using target motion techniques, and distance sampling can then be used to estimate density. In 2015 and 2016, a total of six line-transect surveys were conducted during spring, summer and autumn. Some 7560 km were surveyed across an area measuring 118,710 km2 during which 391 sperm whale detections were recorded. Two vessels were used to conduct these surveys, but the fitted detection functions showed no significant difference in estimated effective strip-widths; thus data were pooled. Density estimates for individual survey blocks ranged from 1.0 individual 1000 km2 to 4.6 individuals 1000 km2, with an overall mean estimate of 380 individuals in the entire study area. The average densities reported here are similar to those reported from a range of known concentrations of sperm whales in the Atlantic, further to the south. These data will be used to assist regulatory authorities determine areas of importance for cetaceans in western Irish waters. It is clear from this survey that western Irish waters, particularly north of 52oN, provide important habitats for sperm whales.

DA10 Decline in fin whale survival in the Gulf of St Lawrence: the effect of terminal bias and capture heterogeneity?

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Estimates of abundance and survivorship provide a quantifiable measure to monitor populations and help define their conservation status. However, the detection of demographic trends in long-lived and wide-ranging animals may be obscured by the lack of statistical power and violation of model assumptions. Here, we used the example of fin whales in the Gulf of St Lawrence (GSL) to illustrate how patterns in temporary emigration and site fidelity may bias the interpretation of results from long-term mark-recapture studies. We applied mark-recapture models to photo-identification data from 1990 to 2016, collected in the northern GSL from June to October, to investigate recent evidence for declines in apparent survival and abundance with particular emphasis on the influence of non-random temporary emigration and individual heterogeneity. The data comprised 5000 identifications of 490 individuals. Based on AICc model selection, the most parsimonious Cormack-Jolly-Seber model included a temporal trend in non-calf apparent survival rates with an increasing decline in the last 5 years of the study. Truncation of the time-series data provided strong evidence that this decline was the result of terminal bias, which could be due in part because of non-random temporary emigration. Agglomerative hierarchical cluster analysis was applied to categorise individuals based on annual and survey site fidelity indices. Heterogeneity in site fidelity patterns was shown to violate the model assumption of equal capture probabilities. While the detected decline in apparent survival probabilities was corroborated by a decrease in the super-population size from 336 (95% CI 325 to 353) individuals in 2004-2010 to 288 (95% CI 278-306) individuals in 2010-2016, this study highlights potential sources of bias which could interfere with the interpretation of results from long-term photo-identification studies.

DA11 Acoustic, genetic and observational evidence indicate the presence of humpback whales (Megaptera novaeangliae) from both hemispheres in Cape Verdean waters during their respective breeding seasons

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A small population of humpback whales breeds around the Cape Verde Islands (West Africa), exhibiting a boreal seasonality. Based on seasonal observations of humpback whales and calves, Hazevoet et al. (2011) postulated that whales with an austral seasonality may also breed in Cape Verdean waters. Regions known to host breeding and calving whales from both hemispheres are rare, e.g. Costa Rica in the North Pacific. Here we present evidence consistent with this scenario in Cape Verde, using results from acoustic, molecular genetic and visual surveys. In April 2014, an SM2M+ underwater autonomous recorder (Wildlife Acoustics) was deployed to a depth of 600 m to record for 10 months, 100 km north of São Nicolau (N 17.6°, W 24.3°) over the abyssal plain (depth 3000 m). Analysis of 1539 hrs of recordings revealed humpback whale song during both austral and boreal spring, with absences in July and October to November. The percentage of positive detection hours conformed to a bimodal distribution, peaking in April (63%) and again in August (29%). In September 2014, 1182 km of visual survey effort was conducted from a sailing vessel throughout the archipelago, resulting in 9 encounters with a total of 12 humpback whales including 2 mother-calf pairs. Two adults were biopsy sampled, both exhibiting mitochondrial DNA control region haplotypes uncommon in the North Atlantic but common in the Southern Ocean. The multi-locus genotypes of the two individuals were also estimated as very unlikely given the allele frequencies detected in Cape Verde humpback whales sampled during the winter. Further evidence of breeding behaviour is required to establish whether Cape Verde constitutes a breeding ground for whales with an austral seasonality. However, using three lines of evidence (acoustics, visual encounters and molecular genetics), our results build a stronger case for this scenario.

DA12 An updated abundance estimate for the endangered population of bottlenose dolphins (Tursiops truncatus) in Bahía San Antonio, Northern Patagonia, Argentina

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Bottlenose dolphins (Tursiops truncatus) used to be one of the most sighted cetaceans in Argentinean waters, but recent studies point to serious population declines in last decades. In Argentina, bottlenose dolphins can be found from Bahía Samboronbón in the province of Buenos Aires, until the province of Chubut, with few records as far south as the province of Santa Cruz and Tierra del Fuego. The population ecology of T. truncatus in Bahía San Antonio, Northern Patagonia, was initially assessed between 2006 and 2011 by members of the Marybio Fundation (Vermeulen, 2014) and continued under the affiliation of Whalefish from 2011 onwards. During this period, land and boat-based surveys were conducted to build a photo-identification database, following the methods explained by Vermeulen & Cammareri (2009). Using mark-recapture analysis, the total abundance of the population ranged from 40 to 83 individuals, showing a decrease over the years. With the aim of complementing the information about the population of T. truncatus in San Antonio Bay, and updating the existing catalogue of individuals, new photo-identification data was collected in the study area between September-October 2017 by members of the Cethus Fundation in collaboration with Whalefish, using the same methods described by Vermeulen (2014). With a total of 60 hours of survey effort, more than 500 photo-identification pictures were obtained for mark-recapture analysis. All clear photographs of dorsal fins are being analysed by eye with the help of a computer-assisted identification system, and will be used to generate a new abundance estimate of the bottlenose dolphins in the area using the program MARK. In addition, the social structure of the population, such as fission-fusion dynamics, will be defined using the program SOCPROG. This information will

allow us to build an updated status of the bottlenose dolphin population of Bahía San Antonio.

DA13 First photo-identification study of false killer whales (Pseudorca crassidens) in the Azores Archipelago

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Cetaceans are very well-documented, being studied globally in a wide variety of forms, whereas others have still gaps about relevant information. One example are the false killer whale (Pseudorca crassidens), an odontoceti species that is still not well documented worldwide. The present study was carried out in Portugal and more specifically in three islands of the Azores Archipelago using cetacean watching trips as the study platform. The study goals were the description of the false killer whales in the area, its abundance, behaviour and distribution, as well as, its relationship with other cetacean species. The sampling period was located in five touristic seasons (from April to October) between 2012 and 2016. With a total of 45 sighting with a mean size of 69.04 ± 12.91 animals and using the photo-identification method, 59 individuals were recorded with 17 animals recaptures (29%). From these, 71% were recaptured almost twice in different years and in two cases, the animals were re-sighting in 5 different occasions between 2012, 2015 and 2016. In the Azores, the initial studies about false killer whales were baselines surveys that summarized just brief descriptions of this species in the Archipelago. Consequently, the results presented here provides the first data and photo-identification catalogue about false killer whales of the North-East Atlantic Ocean.

DA14 Temporal variation of small cetacean presence along French coasts revealed by statis acoustic monitoring

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Static Acoustic Monitoring (SAM) provide a cost effective means to get accurate information on cetacean presence and habitat use, and could be included in a long-term monitoring strategy. For the first time, small cetacean presence was monitored by SAM along the French coast in three constracting areas ; two on the Atlantic coast (the Iroise Sea and the Arcachon bay) and one in the English Channel (in front of Calais). The aims of this study were (1) to describe seasonal patterns of occurrence of harbour porpoises and small delphinids (common, striped and bottlenose dolphins), and (2) to assess the habitat use by studying diel pattern and echolocation activity. C-PODs were deployed on 10 sites over one to three years totalizing 3992 days of data. Harbour porpoises and dolphins have been recorded all year long in all study areas. Nevertheless, in the Iroise Sea, acoustic detections of harbour porpoises were higher in summer (around 4% of Porpoise Positive Hours - PPH) compared to winter months. In contrast, the converse seasonal pattern occurred with an increase in harbour porpoise detections in Arcachon Bay and Calais during winter months (up to 30% of PPH). Such seasonal patterns were in congruence with the few available visual observations. In the context of the European Directives such as the Marine Strategy Framework Directive, our results opened the way for using SAM as a cost-effective method which provides solid baseline data for continuously monitoring the occurrence of small cetaceans. SAM can complement, or potentially replace, visual surveys in coastal areas to investigate spatio-temporal changes in cetacean distribution. SAM should be implemented in regional monitoring strategies to contribute to the estimation of Good Environmental Status of cryptic coastal cetaceans, such as harbour porpoises.

DA15 Abundance estimate of an inshore population of bottlenose dolphins in Ireland using mark-recapture and citizen science

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Bottlenose dolphins are listed under Annex II of the EU Habitats Directive which requires regular reporting on their Favourable Conservation Status (FCS). FCS reporting is based on four criteria: Range, Area of Suitable Habitat, Population and Future Prospects. In Ireland, three genetically discrete populations of bottlenose dolphins are recognised; Shannon Estuary, Coastal or Inshore population and an Offshore population. We used 11 years of photo-identification data collected around the entire Irish coast to estimate abundance using mark-recapture. From a total of 2,667 sightings submitted to the IWDG Between 2005 and 2016, 4% (n=111) contain images suitable for photo-ID. From a total of 507 images of both left and right dorsal fins, 213 individual dolphins were identified. 90% of dolphins photographed presented Grade 1 and 2 (permanent and temporary) marks on their dorsal fin and flanks. Approximately half of the

dolphins were re-sighted ≥ two times and 33 individual's ≥ 5 times. Using 180 using well-marked individuals (85% of the catalogue) we derived an abundance estimate of 360 (SE=40; 95% CI=298 to 457). Using the full dataset of 213 individual dolphins resulted in an estimate of 484 (SE= 54.80; 95% CI = 396 to 614). A discovery curve suggested that not all dolphins were recorded during this study period resulting in an under-estimate of abundance, but the rate of increase declined once the cumulative number of identifications exceeded 170 dolphins in 2014. This estimate is twice as large as previous abundance estimates of this population which were carried out within a more restricted part of their range. With over 95% of the photo-id data collected from opportunistic sightings from members of the public and maritime community, this study highlights the value of citizen science in studies of wide-ranging highly mobile populations. The implications for management and reporting on FCS are discussed.

DA16 Presence of short-beaked common dolphin (Delphinus delphis) in the shallow waters of the south coast of Samos, eastern Aegean Sea

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Comprehending the habitat used by a species is crucial for the development of conservation measures. In the Mediterranean, the sub-population of short-beaked common dolphin (Delphinus delphis) have been listed as 'endangered' by the IUCN Red List in 2003 due to its decline, however available data and knowledge on this subpopulation is limited. Common dolphins in the Mediterranean basin are known to be found in both pelagic and neritic environments, though they are normally found in deeper waters located further from the coast when compared to bottlenose dolphins (Tursiops truncatus). The study area of this research is focused in the marine region between the islands of Samos and Lipsi in the eastern Aegean Sea. The common dolphin presence/distribution data was collected during 2016-2017 and was obtained from a total of 170 boat surveys. Contrary to its typical habitat preference, results show that the most common shallow water-dwelling species studied was D. delphis with 41 sightings, in contrast to T. truncates with 15 sightings. For D. delphis population, a photo-identification catalogue was created, which included the local resident pod census. A more detailed knowledge of the prey distribution and the environmental parameters of the area is also required in order to gain a better understanding of their influence on their respective habitats.

DA17 Baleen whale community off the west of Ireland as determined through Static Acoustic Monitoring (SAM)

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Under Ireland's ObSERVE programme, eight locations between 55.4°N to 49.5°N were monitored acoustically between May 2015 and November 2016. Using AMARs (JASCO) moored at depths of 1,600 to 1,900m a total of 443 days of monitoring were achieved. Fast Fourier Transform and detection window settings were used to detect tonal calls of baleen whales at a resolution of 0.125 to 2Hz. Nearly 200,000 detections were logged comprising five baleen whale species. Fin and Blue whales were recorded in both years with Sei only occasionally, Minke whales only in 2015 and Humpback whales only in 2016. Fin whale detections were most frequent (96% of all detections). Detection positive days ranged from 51-72% from May to August to 100% of days between September to December at the four most northerly sites; while at the four most southerly sites, detections occurred on 50-99% of days. Calls were more frequent in March, April and September to October at most stations, with a reduction in calls during summer. Detections consisted of song notes (20Hz downsweeps) and higher frequency sounds with the latter commonly heard in summer when songs were fewer, while in the autumn calls were almost exclusively song notes. Fin whale detections followed a north-south gradient with a significant negative correlation with latitude. In 2015 no blue whale detections were recorded before September at the four northerly stations, while in 2016 detections started on 22 July and occurred sporadically until 30 October. Most humpback whale detections, consisting of song bouts, occurred between 25 March and 21 April 2016 with no detections after late May. Detections of Sei and Minke whales were very sparse across both years. This study provides a unique insight into the Atlantic baleen whale community off western Ireland across a range of temporal and environmental co-variates within this important migratory pathway.

DA18 Mr. Liable: A resident male sperm whale in the Azores?

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Little is known about the migration routes and lifestyle of male sperm whales around the North Atlantic. Social structure of sperm whales is characterized by female philopatry; forming stable groups through the year and male dispersal. After dispersal, males live in bachelor groups for a few years, becoming more solitary as they age. Mature males spend most of their time in high latitudes, occasionally traveling to low latitudes for breeding. Here we investigate the occurrence of a visually classified mature sperm whale male off Sao Miguel Island, Azores all year around. Our dataset includes sightings and photographs of sperm whales throughout the Azores archipelago obtained from different sources (whale watching platforms, dedicated surveys and others) covering the period of 2010-2017. A basic characterization of the residency patterns for male and female sperm whales in the study area was calculated using the mean monthly sighting rate and the lagged identification rate, to be compared with this specific male. Home range was also calculated using a kernel analysis. A total of 101 sightings for this individual have been recorded since 2010, making him the most observed male off the islands compared to other male encounters. He has been observed every year of the study period, showing some inter-annual differences and is frequently observed in early winter, when he should be migrating to northern waters according to the classic theory. Moreover, most of the sightings of "Mr. Liable" cluster in a specific area, when comparing to other sperm whales observed in the area, suggesting the existence of a specific spatial residency pattern.

DA19 Demographical analysis of the endangered population of the harbour porpoise from the Sea of Azov using a Bayesian-based model

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There is a separate population of the harbor porpoise in the Sea of Azov which is distinct for its morphology and life history. Here a demographical study is conducted based on the sample of porpoises which died in 2000-2013 in the southern Azov. Demographic parameters and abundance trends were assessed using the Bayesian inference and Syler's model with bycatch as mortality risk (the procedure by J. Moore). The abundance of Azov porpoises was consistently declining; as estimated here, in 2001-2012 it declined more than twice, from 13,500 to 6,000. Natural growth rate was within 2-4%, with high birth and natural death rates and high generation turnover rate; the greatest mortality rate falls on the first year of life. The population is endangered due to incidental bycatches in fishing gears. Bycatch was the greatest mortality factor. It led to annual decline in abundance by 27% in some years, because of mortality rise and great losses in birth rate due to takes of individuals which finally did not contribute to reproduction. Bycatch was shown to affect primarily juvenile and subadult animals: at the age of 1-5 years bycatch as the mortality factor was greater than all the natural factors. Notably, in 2000-2002 the population was already stressed under anthropogenic impact, then, in 2006-08, bycatch decreased, and the population stabilized. By 2011, the bycatch rate was lower than in 2000-2002; however, the population was more depleted than a decade before: life span declined (especially, in males), and mortality increased. The birth rate somewhat increased during the observation period, as follows from the model data; however, it did not lead to recovery of the population. Bycatch impact is irregular in mid-term perspective; however, it is extremely great, and the risk of extinction is high for the Azov population.

DA20 Preliminary mark-recapture analysis of sperm whale (Physeter macrocephalus) photo-ID data from the Aeolian Archipelago (Italy)

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Photo-ID of individuals using natural marks provide an efficient and cost-effective approach to document the occurrence of sperm whales (Physeter macrocephalus) and it has been widely used to study in the Mediterranean Sea. The current study used photo-id data collected on April-November period, from 2013-2017 to investigate the occurrence and group characteristics (group size, sex and age class) of sperm whale in the Aeolian Archipelago (Southern Italy). A catalogue of the sperm whale individuals crossing this area was produced including the most frequent mark types

present on different body regions. Totally 27 sperm whales were sighted of which 11 photo-identified from specific marks on different body regions. From the proportional length of body features 22% of individuals were estimated as adults, 33,33% as juveniles and 22,2% as calves while the remaining animals had unidentified age class. Of sighted individuals 22,2% were females and 44,4% males. The remaining animals had unidentified sex. The occurrence was higher in August months and lower in spring, ranging from April to November months. The group size ranged from 1 to 7 individuals (average ± St. Dev. = 2,7 ± 2,4). Larger groups including females with calves were more frequently sighted on August month; solitary males on early/late summer months. These results indicate that the Aeolian Archipelago (Southern Thyrrenian Sea), is an important stepping stone in the migration routes and potential breeding ground for Mediterranean sperm whales. Further results will be needed to estimate sperm whale distribution, abundance and behaviour in this area. Long-term photo-identification efforts and comparison of photo-id data from other research institutions is also needed.

ED EVOLUTION & DEVELOPMENT

ED01 A Finless Common Bottlenose Dolphin Successfully Coping with Its Twist of Fate

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Since 1991, the Ionian Dolphin Project is monitoring coastal dolphins in the Inner Ionian Sea Archipelago, western Greece. Common bottlenose dolphins (Tursiops truncatus) in the area are mostly transient, although a small community of 20-25 animals displays high levels of residency and relatively stable trends. A male bottlenose dolphin known as "Spiti", first photo-identified in April 2001, was observed in September 2003 with a very fresh and conspicuous wound, characterized by the almost complete amputation of its dorsal fin. Successive observations allowed us to witness the healing process of this severe injury. After encountering Spiti on yearly basis for a decade, we last saw it in August 2010, which led us to the assumption that it had died. Nevertheless, during surveys conducted in October 2016 and 2017, covering for the first time waters beyond the historical limits of our study area, we found it at about 100km north. On both occasions, Spiti looked healthy and was associated with 15-20 bottlenose dolphins interacting with a bottom trawler. The cause behind the amputation of its dorsal fin remains unknown, but a plausible explanation may be entanglement with a long-line, or simply the cumulative effect of different injuries caused by intensive social interactions with other dolphins. Our observations indicate that this anatomic structure may not be of vital importance; nevertheless, the dorsal fin is known to provide stability while swimming and to assist in thermoregulation. Hence, its amputation may induce to decreased success when hunting prey, escaping predators or controlling body temperature. By reporting this case, we do not only intend to provide evidence on the capacity of recovery of this animal, but also to gather information from fellow researchers on similar observations to shed light on both the cause behind the drastic change on this dolphin's anatomy and its possible behavioural consequences.

ED02 Energy saving strategy of the cetacean survival or special history of co-evolution of the immune system of Cetacea and their pathogenic microflora

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The reasons of return to a water way of life of ancestral forms of Cetacea about 60 million years ago are still obscure. To one of decisive factors of such strange and absolutely illogical choice for the animals breathing atmospheric air by means of lungs can be considered the strong expressed bactericidal and antiviral activity of the marine habitat. High content of an iodine and NaCl in sea water, the abundance of direct sunshine and low degree of density of individuals of different biological species in one area are factors of the marine habitat which frame a natural barrier to diffusion of pathogenic viruses and bacteria. Our complex researches within five years of changes of the immune system reactivity indices in 55 adult individuals of the bottle-nosed dolphin (Tursiops truncatus) in a parallel combination to a research of quantitative and qualitative characteristics of terrestrial pathogenic Gram-positive coccus microflora which inseminated the upper respiratory tract of dolphins showed very low level of activation of all branches of immune system, especially during first month of adaptation to captivity conditions. The first month of adaptation in terrestrial mammals is, as a rule, characterized by implication by an acute phase of stressful reaction. At the same time the immune system of terrestrial mammals shows the maximum activity. Suppression of factors of immune protection happens much later during a chronic stress when the energy potential of an adapting organism is spent. It is well known that an energy provision of the immune responsiveness together with genesial function are the most expensive in energy

consumption physiological functions of organism. Therefore the return transition Cetacea to the marine habitat can be accepted as the energy saving strategy of survival.

ED03 Maturation of auditory cortex in bottlenose dolphin *(Tursiops truncatus)*

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Marine Cetartiodactyla undergo precocious fetal maturation of the central nervous system (CNS) necessary for the motor performance required instantly after birth. Nonetheless, unlike the terrestrial mammals, postnatal development of the CNS is guided only by selected sensorial inputs, since olfaction and taste are absent or poorly developed. Several studies have described the cytoarchitecture and potential circuitry of the adult auditory cortex in these species. However, data on the maturation of the cerebral cortex responsible for the sensory decodification of sound are scarce. In the present study we examined the auditory cortex of 11 bottlenose dolphins, divided in four newborns; four adults; and three very old animals. Serial 6µm thick Nissl-stained sections were examined with and processed with an Image-J software. The objective of our statistical investigation was to determine the following parameters for each individual neuron: size (including perimeter and area); shape irregularity (including linear irregularity and aspect ratio); and neuronal density. The final outcome was the definition of the mean absolute deviation (MAD) of the diverse parameters examined. Our results indicate that the auditory cortex of the bottlenose dolphin contains a number of pyramidal neurons unexpected in a classical five-layered sensory column. Neurons of newborn dolphins show markedly irregular shape, especially in pyramidal neurons of layer V, characterized by irregular perimeter but smaller area. Adult dolphins have a more defined orientation of neurons. Global complexity and mean decline from newborn to adult to old animals. On the whole, our data suggest that neurons of the auditory cortex change and refine their shape during growth and maturation, add considerable branching with time, and decline in number and complexity in old specimens. The presence of several pyramidal neurons in layer V suggests the existence of projections to generator of motor schemes in the brainstem required to early control of striated muscles.

ED04 Evolutionary history of the porpoises *(Phocoenidae)*

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The six species of porpoises inhabit the cold waters of the globe, displaying a textbook example of anti-tropical distribution in marine mammals. Nevertheless, the evolutionary history of the porpoises still remained poorly understood, but this knowledge is crucial to illuminate the conservation issues reported in these species (e.g. the nearly extinct vaquita, Yangzte finless porpoises; subspecies of harbour porpoises; poorly known spectacled and Burmeister porpoises). In this study, we reconstructed the evolutionary history of the porpoises in relation to past climatic changes. We used Next Generation Sequencing to assemble the mitochondrial genomes of 57 porpoises, resulting in a 16303 bps alignments. In contrast to previous beliefs, phylogenetic and population genetic analyses revealed that spectacled and Burmeister's porpoises share a more recent common ancestor than with the vaquita. The vaquita would have split from the other during the Pliocene and then recently collapsed. We also observed unreported subspecies level of divergence within the Pacific harbour porpoises similar to those reported in the North Atlantic, suggesting a richer evolutionary history than previously thought for this species. Our results provide a new perspective on the divergence, adaptation and

speciation processes involved in the diversification of the porpoises.

ED05 Study of the juvenile stage of fin whales (Balaenoptera physalus) through the analysis of lipid content and stable isotopes in earplugs

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The fin whale, Balaenoptera physalus (Linnaeus, 1758), is a cosmopolitan cetacean that it is found in most large water masses of the world. Even though it is a well-studied model species, the juvenile stage of fin whales presents many questions yet to be resolved. The current study provides an insight into the feeding and nutritional dynamics during the juvenile stage of fin whales off Galicia (Spain). We carried out analysis of the lipid content and isotopic signal of the annual growth layers in the earplugs of 20 individuals. These individuals were caught by commercial whaling operations in the waters off Galicia in 1983, 1984 and 1985 and sampled at the Caneliñas land station. Taking as a baseline the stable isotopic values of the main food item (the euphausiid Meganyctiphanes norvegica), the results obtained show that the isotopic discrimination factor of earplugs is +3,39 ‰ ± 0,95 (mean ± SD) for δ15N and -1,42 ‰ ± 0,47 (mean ± SD) for δ13C. The negative value of the δ13C isotopic discrimination factor may be attributed to the preservation method, 10 % formaldehyde, which may have affected the isotopic value of carbon. Lipid content and δ13C values fluctuated during the juvenile period, although they did not show any generalized pattern. However, δ15N values of juvenile stage (1-5 years old) are higher than δ15N values of mature stage. Moreover, the results show that lactation affects neonates and calves in different ways: a) by decreasing the earplug lipid content when the calf finishes lactation and b) by increasing the δ15N. We can conclude that, despite earplugs may provide critical information of the early life of fin whales, they are not a straightforward material to assess the migration cycle because of the various variables that interfere in the isotopic signal of the growth layers. Research supported by project CGL2015-70468-R (MINECO/FEDER,UE).

GE GENETICS

GE01 Further insights into the genetic differentiation of North Atlantic killer whale populations with particular reference to the West Coast Community

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Building on previous research by Foote et al. (2011) on the genetic differentiation of North Atlantic Killer whales (Orcinus orca), 15 additional skin samples from Scotland and Ireland were screened for variation at 15 microsatellite DNA (mtDNA) loci. The aim was to investigate genetic relatedness of these new samples when placed in a wider dataset of individuals from across the North Atlantic (n = 97). Emphasis was placed on one individual in particular known as 'Lulu', an adult female, who in 2016 stranded on Tiree, Inner Hebrides, Scotland. Lulu was part of a well-documented community of killer whales, the 'West Coast Community' (WCC) with a geographical range mainly concentrated along the west coasts of Scotland and Ireland. It is now thought that there are just eight individuals left and with no sightings of a calf in over 20 years, there is great concern for the viability of this community (Beck et al., 2014). A skin sample from Lulu was the first to be taken from a confirmed WCC individual. Results from genetic analysis indicate that Lulu displays low levels of heterozygosity suggestive of a bottleneck, either from a founder effect or a contemporary reduction in population size and breeding opportunities. Haplotype analysis from sequencing a region of mtDNA was also undertaken on all samples to identify where they belong in the context of previously identified populations (Foote et al., 2011). The results support the hypothesis that Lulu belongs to a relatively small community comprising a limited number of individuals which is likely to be critically endangered. Genetic analysis of other samples from the WCC would provide a more complete insight into the status of this population.

GE02 Population structure of sei whales (Balaenoptera borealis) inferred from mitochondrial control region DNA sequences and microsatellite genotypes

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The International Whaling Commission currently recognizes 3 stocks of sei whales (Balaenoptera borealis) in the North Atlantic, mainly based upon historical catch and sighting data. In this study, we evaluated the validity of this division into stocks by analyzing 87 samples collected from 3 different sites in the North Atlantic; Iceland, the Gulf of Maine and the Azores. The genetic diversity in mitochondrial DNA (mtDNA) control region sequences and at 7–11 microsatellite loci was analyzed for spatial structure. Furthermore, we analyzed 489 previously published samples from the North Pacific to infer the time and degree of genetic divergence between the North Atlantic and North Pacific sei whale populations as well as population migration rates. No statistically significant deviations from homogeneity were found among the North Atlantic samples at mtDNA or microsatellite loci. The genealogy estimated from the mtDNA sequences revealed one clade unique to the North Atlantic and another including all North Pacific haplotypes as well as one GenBank-downloaded haplotype from the Southern Hemisphere and one deviant North Atlantic haplotype detected in a single sample from the Azores. The degree of genetic divergence between the North Atlantic and North Pacific populations was significantly high (mtDNA $\Phi ST = 0.72$, microsatellite $\Theta = 0.20$; $p < 0.001$) and the divergence time between the populations was estimated at 163,000 years ago, although inference was limited by an absence of samples from the Southern Hemisphere and uncertainty of some parameter values. We found very low migration rates between the 2 ocean basins; 0.007 migrants per generation from the North Atlantic into the North Pacific and 0.248 vice versa. Although we did not detect genetic heterogeneity among the North Atlantic samples, the uncertainty in our estimates was too high to reject the possibility of multiple stocks.

GE03 Genome-wide SNPs improve population resolution for the Baltic harbour porpoise (Phocoena phocoena)

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The harbour porpoise (Phocoena phocoena) is a highly mobile cetacean found in coastal waters across the Northern hemisphere. It inhabits water basins that vary broadly in salinity, temperature, and food availability, which could drive differentiation among populations. Population structure within the North and Baltic Sea is not fully resolved, especially in Baltic-proper populations. An initially study showed higher resolution from single nucleotide polymorphism (SNP) markers than that previously detected with mtDNA haplotype data and microsatellites. We extended the RADSeq SNP data to further unravel subtle population structure. Based on 2518 loci from 109 samples, we performed PCA and sPCA which identified splits between populations in the Kattegat, the Belt Sea, and the inner Baltic Sea. We can also observe this population split when analysing females or summer animals separately. Taking into account migration behaviour and female philopatry, these data further support an inner Baltic population split and indicate that there is a need for new conservation measures to save and support the different Baltic populations. To investigate if these SNPs are correlated with local adaption, we have mapped them against a genomic resource of Phocoena phocoena. In doing so, we can identify positions of local adaptive traits on the individual and population level. Our study underscores the value of whole genomes in conservation genomics, as phased haplotypes across loci of known genomic location can yield a resolution superior to those of anonymous randomly distributed polymorphisms. Specifically, this method provides very detailed information for any individual, potentially allowing for inference of migrants and residents as well as for an assessment of admixture/genetic exchange between different subpopulations.

GE05 Metagenomic study of Caspian seals *(Pusa caspica)* microbiome of respiratory, urogenital and alimentary tracts

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Next generation sequencing of 16S ribosomal RNA gene fragment of the microflora of respiratory and gastrointestinal tracts of the Caspian seal was carried out using the gene-specific primers to the 16S V3 and V4 regions, according to the Illumina protocol. The analysis of the microbiome of the respiratory, alimentary and urogenital tracts of Caspian seals indicates an abundance beta-diversity of the bacterial community represented by 2647 identified taxa. The pathogens of bacterial zoonoses and opportunistic infections of marine mammals have not been identified in the beta community of Caspian seal microbiota with the exception of some facultative pathogenic microorganisms. As a result of the metagenomic analysis, 515 species of microorganisms were identified in the bacterial microbiota of the nasal cavity of the Caspian seal. Despite the geographical isolation and separate evolution of Caspian seals from other marine mammals, bacterial species isolated from seals in other parts of the world, such as Corynebacterium phocae and Areanobacterium phocae, have been found in their nasal microbiome. C. phocae is isolated from the nasal cavities of Phoca vitulina. C. caspium, was isolated from Caspian seals during the epizootic of morbillivirus infections among them in 2000. A. phocae is a common pathogen of wound infections, which is sometimes associated with systemic infections in coastal marine mammals in California. The total species-level taxonomic categories of buccal microbiome of Caspian seals identified 760 classifications. The microflora of smears of urogenital canals of Caspian seals were distinguished by the presence of bacterial species of marine environments, such as Cetobacterium ceti, Planococcus maritimus. The bacterial microbiota of rectal swabs of Caspian seals is represented by characteristic species of the intestine environment. The study indicates the necessity for permanent monitoring of the health parameters of the Caspian seal to identify the introduction of clinically significant bacterial pathogens into their population.

GE06 Genetic structure of bycaught harbour porpoise, Phocoena phocoena in Norwegian waters assessed with microsatellite markers

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Understanding the population structure of species, particularly the red-listed ones such as the harbour porpoise, Phocoena phocoena, is crucial to ensure the conservation of their genetic diversity but also to conduct an accurate and sustainable management when needed. The United States National Oceanic and Atmospheric Administration (NOAA) issued a rule in 2017 to ban the importation of seafood from countries where fishing provokes more casualties of marine mammals than US-standards allow, or when these are not properly documented. Thus, NOAA has established a five-year exemption period allowing foreign harvesting states to assess their marine mammal stocks, estimate and decrease bycatches, and develop regulatory programs to meet the new criteria on an ongoing basis. Therefore, to prove the sustainability of harbour porpoises bycatch in Norway, some knowledge on three different topics is required: a) the population genetic structure of the species, b) their abundance in Norwegian coastal waters, and c) the bycatch numbers. The last two issues have been addressed through studies conducted in 2016, which covered the geographic range from Oslofjorden (south) to Vestfjorden (north). Regarding the first aspect, in the last 25 years, the body of literature dealing with the genetic structure of harbour porpoise has relied upon some microsatellites isolated for the species, and greatly on loci devoted for different taxa, from cows to cetaceans (e.g. humpback, pilot and sperm whales, beluga, orca…). In total, some 47 microsatellites plus two sex markers have been shown to amplify, but most of the studies barely use a ten. The first aim of the present study was to optimize and establish a suite of multiplex reactions for the largest possible number of polymorphic microsatellites in harbour porpoise to increase the statistical power of the genetic estimates. The second aim was to assess population structure in the individuals bycaught in Norway.

GE07 Linkage disequilibrium in population genetics .How to assess population size and improve conservation management for endangered species

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The evolutionary analysis of genetic diversity has fundamental implications in the management of conservation practices for marine mammals. In particular, the identification of speciation and adaptation phenomena within and

between populations plays a key role in prioritising and distributing conservation efforts. However, the related data collection and analysis are typically cost-intensive and complex. The study of linkage disequilibrium (LD), the correlation between genetic loci, enables the understanding of intra- and inter- population demographic events by inferring sizes and gene flow events. This study aims to demonstrate the use of LD analysis as a useful tool in the assessment of genetic variability in the context of conservation management. A bioinformatic pipeline for the estimation of LD between marine mammals' populations from low-coverage whole-genome sequencing data is developed. We performed a pilot analysis on five killer whales' ecotypes. We demonstrate that this approach can identify bottleneck and expansion events. The translation of LD results into more accessible indicators applicable to contemporary conservation practices could further contribute to making genetic variability studies a basis for policies in marine mammals' conservation.

HD HABITAT & DISTRIBUTION

HD02 The distribution and vocal behavior of the Atlantic white-sided dolphins (Lagenorhynchus acutus) in northern Norway

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The distribution and behavior of the Atlantic white-sided dolphins (Lagenorhynchus acutus) are understudied in Norway. We have conducted boat surveys and underwater sound recordings in the Vestfjorden, in northern Norway. 70 sightings of L. acutus were recorded including Photo-ID cataloging of 55 individuals and 29 re-sightings of the catalogued individuals. Our study indicates a stronger presence of L. acutusthan previous reported in northern Norway. The dolphin's vocalizations consisted of clicks (1-24 kHz), buzzes, calls, whistles and stereotyped whistles. Four vocalization categories (clicks, whistles, buzzes and calls) of L. acutus were quantified during four surface behavioral categories (traveling, milling, socializing and foraging). We investigated if specific vocalizations of L. acutus were associated with specific behavioral categories and if vocal behavior changes with activity. In general clicks were the most commonly recorded vocalization (97.8-99.5%), followed by whistles (65.4-76.2%). The relative abundance of each type of vocalization was correlated with the dolphin´s behavior. Clicks were consistently associated with foraging (99.2%) and milling (99.5%), whistles were consistently associated with socializing (70.2%) and milling (76.2%), calls were consistently associated with traveling (32.4 %), and buzzes were absent during milling and varied (0-14.1%). Two foraging strategies were observed in deep and shallow water displaying the flexibility of L. acutus feeding on Atlantic mackerel. Our observations indicate a larger distribution and variety of vocalizations associated with different behaviors in this population that requires further investigation.

HD03 Fin whale (Balaenoptera physalus) acoustic presence off Elephant Island, Antarctica

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Recent visual observations suggest that the region around Elephant Island serves as an important feeding area for fin whales. Passive acoustic recordings collected northwest of Elephant Island (61°0.88'S, 55°58.53'W) from January 2013 to February 2016 were analysed manually for seasonal and diel patterns of fin whale 20 Hz calls. Overall, calls were detected year-round, although in some years calls were not present during all months. For all years, fin whale calls were consistently present from February to July for more than 90% of days per month. From August to January, percentage of days with calls varied between years, with presence exceeding 75% of days per month throughout 2014, whereas in 2015 calls were absent in October and November. In 2013, fin whale calling dropped in August and increased again towards November (present 80% of days per month). Diel patterns in call activity were analysed for a 10-month subset of the data from 2013. Fluctuations in call rates did not follow a diel pattern nor correspond to local insolation. During peak calling period, maximum calls amounted approximately to 80 per minute. Fluctuations in call presence outside the peak calling period may be explained by variation in local ice conditions as drift may temporally force the animals away to areas with reduced ice concentrations. Furthermore, delays in the timing of migration between age groups, sexes and/or reproductive classes may also affect temporal patterns in the clustering of calls. The observed peaks in fin whale call activity correspond to the periods during which fin whale super groups have been repeatedly observed visually in this region. Our year-round acoustic analysis indicates that the Elephant Island region is likely to play an important role

for fin whales throughout the remainder of the year.

HD04 Estimating the distribution of the common bottlenose dolphin (Tursiops truncatus) in the Ría de Arousa, NW Spain

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Species distribution models (SDMs) are important tools in determining the distribution of marine organisms, including my study species the common bottlenose dolphin (Tursiops truncatus). The input of SDMs are ecogeographical variables (EGVs) and presence-only or presence-absence data, and the output is a habitat suitability map showing suitable habitat for a species. The study area was Ría de Arousa (NW Spain), which is ideal for mussel farming due to its high productivity, which in turn attracts marine organisms to the area. One SDM using presence-only data (MaxEnt) and one SDM using presence-absence data (GLM) used five EGVs: depth, distance to coast, distance to mussel farm, temperature and tide level, to predict the distribution of T. truncatus in the Ría. I used data from a three-month period, which accounted for 139 presence records for MaxEnt and additionally absence data for GLM. The predictive competence of the models was compared. Especially the variable distance to mussel farm was of interest since shellfish farming has generally shown to have a negative impact on the distribution of Cetacea. The results by both models indicated a strong relation between T. truncatus presence and the variable distance to mussel farm, i.e. the species occurred in the close proximity of the farms. Most certainly this is due to the high density of prey species around the mussel farms T. truncatus relies on. MaxEnt provided visually a good habitat suitability map, whereas GLM contributed to the results quantitatively. By enhancing the knowledge of dolphins' distribution, the impact of the growing aquaculture industry on the species can be estimated and vice versa, the impact of dolphins on fisheries can be better understood. Understanding distribution patterns of marine mammals is essential in habitat protection planning and requires continuous research on a long-term basis.

HD06 Encounters with an anomalously white harbour porpoise (Phocoena phocoena) – first record of porpoises in the mouth of Douro River (Porto, Portugal)

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Among the six species of Phocoenidae, the harbour or common porpoise, Phocoena phocoena, is the most abundant in the Northeast Atlantic. Harbour porpoise is a species of concern in several international conventions, and is listed under the Annex II of the European Habitats Directive (Directive 92/43/CEE), so Member States are required to designate special areas of conservation (SAC) to protect their populations. Their coastal distribution makes them more susceptible to anthropogenic threats, and they are particularly threatened by fishery activities through by-catch. In Portugal, their conservation status is "Vulnerable" due to their low abundance, and information on the impacts of human activities in the populations is still scarce. On the May 28th, 2017, a group of four harbour porpoises was spotted in the mouth of Douro River, North of Portugal (at the coordinates: 41.13N; 008.67W), during a dedicated survey for cetacean monitoring. Since then, random observations from land were made from a peer in the mouth of Douro River (at the coordinates: 41.14N; 008.67W), and the monitoring was performed by trained observers, with the support of binoculars (7x50mm). Observations lasted for periods of, at least, three hours per day. An anomalously white individual was systematically observed in the area, either alone or within the porpoises group. In 31 days of observations, porpoises were recorded 13 times at different periods of the day, and the anomalously white individual was present in 11 of the sightings. Although harbour porpoises' distribution in the Iberian Peninsula has been described, this is the first record of the species in the mouth of Douro River and includes a rare phenomenon worldwide, the presence of an anomalously white individual. Further studies, monitoring and dedicated surveys are needed to understand this group and its use of area, in order to effectively manage and protect the population.

HD07 Common Bottlenose Dolphin (Tursiops truncatus) population in the Marine Protected Area of the Cap de Creus Canyon, Northwestern Mediterranean

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In the early 2000s the Common Bottlenose Dolphin (CBD) (Tursiops truncatus) population of the Cap de Creus Marine Protected Area (MPA) was highlighted as the one with the highest density along the Catalan coast, however a dedicated survey on this population was never carried out. The relevance of the area for marine fauna is due to the presence of the underwater canyons of Cap de Creus and Lacaze-Duthiers, both identified as Sites of Community Importance (EU-SCIs). Both canyons also define the southwest boundary of the Shelf of the Gulf of Lion IMMA (Important Marine Mammal

Area), sharing a common valley at 1000 meters depth, where deep-sea currents circulate and upwelling of nutrients provide a constant supply of nutrient-rich waters in the surrounding area. Altogether, this area offers an important habitat for the 'Vulnerable' Mediterranean CBD population. In summer 2017 a two-year CBD monitoring program started in the MPA as study area. Visual transect and photo-identification surveys were conducted on a 6-meter long RIB. A total of 1182 nm of effective effort were carried out, with a total of 12 CBD sightings (ER=1,015), all occurring at depths shallower than 200 meters. Dolphins were detected mostly (75%) in groups up to 10 individuals (average group size 7.8) and all groups were smaller than 16, except for one with 25 dolphins. Presence of calves (1-4) was detected the 67% of the times, resulting in a ratio of 1,083 calves/sighting. A total of 6893 photographs were taken, resulting in a catalogue of 1530 good-quality photographs and 80 individuals photo-identified. Most of the sightings (75%) were associated with trawl fishing activities and 100% occurred during fishing workdays, indicating a strong association between CBDs in the area and trawling vessels presence and suggesting a potential CBD-fishing interaction in this MPA, stressing the need for further research.

HD08 First record after thirty years of rough-toothed dolphin (Steno bredanensis) offshore Eastern Sicily

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Rough-toothed dolphin (Steno bredanensis) was only recently included among the cetaceans regularly present in the Mediterranean Sea, as a result of sightings mainly reported in the Levantine basin (Eastern area). Little is currently known about Steno bredanensis distribution, ecology and conservation status in the Mediterranean Sea. Historically, its status changed to 'possibly regular' after an unexpected sighting offshore Eastern Sicily on September 1985, during a cruise for the Woods Hole Oceanographic Institution (WHOI). Watkins et al. reported a large aggregation (approx. 160 animals) of rough-toothed dolphins offshore Cape Passero (Southeastern Ionian Sea, 35°28'26" N, 15°53'04" E). In July 2017, WHOI was involved in an oceanographic cruise in the same area, led by CIMA Research Foundation. A new sighting of a specimen of rough-toothed dolphin occurred (36°35'80"N, 15°32'35" E) and a new acoustic dataset was acquired for this species. For the first time after about thirty years, we describe acoustic recordings of Steno bredanensis acquired in this deep-pelagic zone of the Mediterranean Sea. Acoustic data from 1985 were recovered from the Watkins Marine Mammal Sound Database (http://www.whoi.edu/watkinssounds/). Custom algorithms were developed in MATLAB to extract signals parameters of the main vocalizations recorded (clicks and whistles) within both datasets. Despite the short duration of the new acoustic sample (~ 30 min) and the different behavioral contexts of the sightings, the analysis shows similarities in acoustic features of the signals recorded. In this work, we present new information on presence and acoustic behavior of rough-toothed dolphin in a data-lacking zone of the Mediterranean Sea and we highlight the importance of open source sound databases as scientific reference datasets.

HD09 Tracking striped dolphins movement in the Alkionides Gulf (Gulf of Corinth, Greece)

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Reticule binoculars allow users to report azimuth and declination from the horizon and to calculate the distance from shore of observed dolphins, dependent on a known elevation above sea level. Together with compass data, reticular data allow tracking dolphin's movements. From April 2016 to December 2017 land based surveys were carried out to analyse striped dolphin (Stenella coeruleoalba) movements in the inshore waters of the Alkionides Gulf (Gulf of Corinth, Greece). The area of study presents deep waters and the characteristics of a pelagic habitat close to shore, making it an ideal area for land base monitoring. Surveys were conducted from three different locations: "Melangavi Cap", "Milokopi", and "Petrita". Survey spots are located about 8km from each other and allow monitoring 30km of coastline. An effort of 175 surveys and 435 hours of monitoring was carried out, 114 sightings were realized. The sighting frequency resulted

0,28 sights/hour for 2016 and 0,25 sights/hour for 2017. Statistical analysis shows that the presence of striped dolphin during the spring is greater than during the rest of the year. 25 hours of dolphins sighting were examined. The locations of dolphins derived from marine binoculars were analysed employing softwares BaseCamp (Garmin) and QGIS. Dolphin's movement are presented in relation to the time of the day, the season and the presence/absence of boats in the study area.

HD10 Dakhla Bay (Morocco) 20 years on, a preliminary study on cetacean diversity and distribution in the area

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Dakhla Bay is a shallow bay found on the North-West coast of Africa (southern Morocco). Its waters provide shelter for some cetacean species, such as the vulnerable Humpback dolphin (Sousa teuszii), as classified by the IUCN. Over 20 years ago, Notarbartolo-di-Sciara and his team carried out a study in the area with the objective of identifying North Atlantic Right Whale (Eubalaena glacialis) wintering grounds. The aim of this study was to determine the species currently found in the area and their distribution, as well as, to compare findings with the sightings reported by Notarbartolo-di-Sciara. This preliminary study was conducted throughout April 2016 on-board a fast boat and from land based watches. In total, 725 km were covered by boat and approximately 16 h were spent searching from land. The total number of sightings were 8: 2 of Bottlenose dolphins (Tursiops truncatus) and 6 of Humpback dolphins. In addition, there were 4 opportunistic sightings of Killer whales (Orcinus orca) in the southern part of the Bay. This shows that after 20 years, despite the fishing pressure on the area, Humpback dolphins and Bottlenose dolphins are still present in the Bay. In contrast, North Atlantic Right Whales have still not been recorded in the area. Future studies could be focused on the ecology of the Killer whales seen in this shallow bay.

HD11 Results of cetaceans monitoring in the three-year period 2013-2015 along the Livorno-Bastia sample transect in correlation with fixed environmental parameters

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Cetaceans are exposed to increasing threats due to human activities. Due to this reason it is important using habitat modelling to identify their key areas and to better understand their spatial and temporal distribution to reduce anthropogenic pressure. The aim of this study was to investigate cetaceans presence and distribution in relation to main environmental parameters in the north Tyrrhenian Sea, an area not deeply investigated yet. The monitoring was conducted by ferries following a standard protocol from 2013 to 2015, along the Livorno – Bastia route. This area is strategic as located within the Pelagos Sanctuary for the protection of Cetaceans and being a natural ecological corridor for animal migrations. The most frequently observed species during the study were three: Stenella coeruleoalba, Tursiops truncatus and Balaenoptera physalus. For these, applying the Generalized Additive Models, was analyzed the correlation between the sightings and five fixed environmental parameters (Depth, Slope, Distance from Coast, Aspect Est, Aspect North). The parameter that most influenced the distribution of striped dolphins during the three years of study was the depth, according to the literature; while seasonally the correlation with aspect est in the summer and slope in autumn was significant. Instead the presence of bottlenose dolphins decreases with the growth of depth, even though they showed some flexibility of habitat: they have often been observed outside the continental platform especially in winter. No correlation emerged between the parameters considered and fin whales, which were turned out to be absent in the area during the winter season. In conclusion, this study contributed to gathering information on the presence and distribution of cetaceans in an area not well investigated but with a high ecological importance; also responding to legislative requirements and deepening the knowledge of species classified by the IUNC as vulnerable or "deficient data".

HD12 Long term evolution (1992-2015) in the distribution and the reproduction of three species of cetaceans in the north-western Mediterranean Sea

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The north-western Mediterranean Sea is known as a feeding area for many cetacean species, leading to the creation of the Pelagos Sanctuary for marine mammals in 2002. In this study, we highlight that this area is becoming a place for parturition for three species: sperm whale, long-finned pilot whales and fin whale. We use data, collected with the line

transect method, from 2 French organisations (EcoOcéan Institut and WWF-France), from 1992 to 2015. The datasets totalised 86,055 km covered in prospecting effort (95% between June and September), 213 sperm whale sightings (358 individuals), 62 long-finned pilot whales sightings (873 individuals) and 1,089 fin whales sightings (1,831 individuals). Neonates data have also been collected. Dividing the data in two decades (1992-2002 and 2005-2015) we show that for pilot whales the reproduction rate is 3.1% in the first decade and slightly higher (4.2%) in the second. Spatially, the frequented area of the groups with neonates of this species has extended offshore the Provençale coast. For sperm whale, the reproductive rate was 0 for the first decade and reached 1.8% for the second period. Here too, social units nowadays frequent the offshore of Provence. For fin whales, the reproductive rate is 0.2% for the first decade and 0.8% for the second. The groups with neonates are frequenting the Liguro and recently the Provençale area. We were able to define that at least a strip of 90km offshore the french Mediterranean coast, within and outside the Pelagos Sanctuary is a feeding and parturition area for these three species. These results of the evolution of the use of this area over time should stress the need for a larger Marine Protected area offshore Provence and Gulf of Lion.

HD13 Habitat modelling of offshore Irish waters based on visual data collected during the Cetaceans on the Frontier Surveys (2009-2014)

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With 25 cetacean species recorded to date, the Irish Exclusive Economic Zone's (EEZ) is considered as one of the most important habitats for cetaceans in Europe. These species are protected under the EU Habitats Directive and the Marine Strategy Framework Directive (MSFD). Based on a complex topography, Irish waters contain a range of habitats for a variety of cetacean species, from shallow continental shelf waters and offshore banks (<200m) to deep ocean basins and canyons (>2500m). Habitat and species mapping is essential and yet, information on habitat use in offshore Irish waters is poor. To provide robust scientific data and gain a more complete understanding of habitat use, seasonal distribution and relative abundance of cetaceans within the EEZ, Cetaceans on the Frontier (COTF, 1-7), an annual dedicated cetacean survey was carried out in Irish offshore waters from 2009 to 2014. The project was coordinated by the Galway-Mayo Institute of Technology in collaboration with the Irish Whale and Dolphin Group and was funded under the Marine Institute's competitive ship-time scheme, through the Marine Research sub-programme of the National Development Plan. For an optimal assessment and monitoring of offshore cetacean species, the COTF surveys implemented multidisciplinary techniques and incorporated an ecosystem approach to survey birds, megafauna, plankton, microplastics and oceanographic parameters. More than 350 hours of visual observation were accessed with over 400 cetacean sightings input into habitat models with 25 environmental co-variates. The objective of the present study was to analyse the visual data collected and to model habitat preferences across a range of co-variates. Results from this programme will be valuable to inform policy makers and assure an optimal management of offshore Irish waters.

HD14 Cetacean distribution off the central Catalan coast, NW Mediterranean Sea

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Four different species of cetaceans can be frequently seen over the continental shelf and slope off the Catalan coast: the fin whale (Balaenoptera physalus), the Risso's dolphin (Grampus griseus), the bottlenose dolphin (Tursiops truncatus) and the striped dolphin (Stenella coeruleoalba). Although several studies confirm the presence of these species in the NW Mediterranean Sea, there is a lack of information about their distribution off the central Catalan coast. Hence, a better understanding of their distribution is the first step to increase our knowledge on the different species. This study aims to provide baseline information on the distribution of the fin whale, the Risso's, striped and bottlenose dolphins off the Catalan coast, which could be used in the future to promote conservation measures of these species and the habitats they inhabit. Data were collected during 72 dedicated boat surveys carried out between 2013 and 2017, covering a total distance of 1,925 nautical miles. GIS software was also used to assess the distribution of the different species in the study area. A total of 125 sightings were recorded: striped dolphin was the specie scoring the highest number of sightings (63), followed by the fin whale (25), the bottlenose dolphin (34) and the Risso's dolphin (5). Mean depth at which the different species were seen was also recorded and this varied between species. Risso's dolphins (770 ± 101 metres) and striped dolphins (563 ± 34 metres) were commonly seen in pelagic waters, whereas fin whales (400 ± 70 metres) and especially bottlenose dolphins (152 ± 40 metres) were seen in shallower waters.

HD16 First video documented presence of Mediterranean monk seal in Southern Apulia (Italy)

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Sightings of Endangered monk seal (Monachus monachus) specimens have been increasingly reported along the coasts of its historic Mediterranean distribution over the last two decades, even from countries where the species was considered extinct for about half a century. These encounters have been documented and verified particularly along the coasts of the Adriatic-Ionian basin. The activities carried out in Salento (Southern Apulia, Italy) since 2012, engaging with local protected areas, authorities and different stakeholders (organizations, museums, universities, fishermen's cooperatives and tourism sectors enterprises) allowed us to record and verify 10 monk seal sightings (from 2009 to 2014) in the area. However, the last sighting with photographic documentation dates back to 1973. In June 2017, after six years of monitoring and awareness of the territory, immediately after the sighting, we received a video evidence of such presence. The footage, and the resulting interview with the witnesses, documented the presence of a Mediterranean monk seal's specimen, about 2 meters in length, along the coast of Tricase (Lecce, Apulia). This new event has a remarkable importance to the hypothesis that Salento and the Adriatic-Ionian basin might play an important role in the overall conservation of the species.

HD17 Large-scale movements of bottlenose dolphins (Tursiops truncatus) within the Macaronesia (NE Atlantic): dolphins with an international playground

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The movements of the bottlenose dolphin (Tursiops truncatus) are well documented in each of the Macaronesian archipelagos of the Canaries, Madeira and the Azores. Nevertheless, little is known about the connectivity of the species among these three oceanic archipelagos. This study aimed to identify wide-range movements between the archipelagos of Madeira-Azores (≈ 1000 km), Madeira-Canaries (≈ 500 km) and Azores-Canaries (≈ 1500 km). This was done through the compilation and comparison of bottlenose dolphin's photo-identification catalogues of the different archipelagos and, the creation of a common Macaronesia catalogue. We compared one catalog from Madeira (n=363), two catalogues from different areas in the Azores (n=495, n= 176), and four catalogues from different islands of the Canaries (n=182, n=110, n=142, n=281), summing up to 1791 photos. The results showed a total of 26 individual matches, mostly between Madeira-Canaries (n=23), and three between Madeira-Azores. No matches were found between the Canary Islands and the Azores, as well as among the three archipelagos. The minimum time recorded for an individual travelling between the Canary Islands (La Palma) and Madeira (≈ 460 km) was 62 days. Four individuals were seen together in La Palma and in Madeira, less than three months apart, suggesting that these individuals may have travelled together. The considerably higher number of individuals that were re-sighted between Madeira and the Canary Islands might be explained by the proximity of these two archipelagos. This study shows the first inter-archipelago movements of bottlenose dolphins within the Macaronesia region, emphasizing the high mobility of this species and supporting the high gene flow described for oceanic animals inhabiting the North Atlantic. The dynamic of these wide-range movements strongly denotes the need to review marine protected areas established for this species in each archipelago, calling for resolutions from three autonomous regions and two different countries.

HD18 Gradient in "hotness": Using and evaluating emerging hot spot analysis to test long-term changes in dolphin distribution off Kaikoura, New Zealand

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Spatial statistics are a powerful tool to rapidly evaluate spatio-temporal patterns and trends in animal populations. In this study, we evaluated the use of the ArcGIS Emerging Hot Spot Analysis (EHSA) to determine whether there was a spatio-temporal distribution shift in dusky dolphins (Lagenorhynchus obscurus) off Kaikoura, New Zealand. The EHSA tool calculates two statistics to examine spatio-temporal patterns in dolphin sighting densities: (1) the Getis-Ord Gi statistic to identify the location and degree of spatial clustering of sightings, and (2) the Mann-Kendall trend test to analyze temporal trends across the time series. These results were then used to categorize bins using the EHSA tool with a time-step of 1 year and different neighborhood distances per season. Dolphin sightings (1995-2013; n = 8,658) were provided by the tour boat company, Encounter Kaikoura. We assumed equal tour boat effort and normalized sightings by number of trips per tour-year and austral season. We then used the Kernel Density tool to create the Core Area (50%) and the Home Range (95%) by volume contour for all years and austral seasons combined. The EHSA tool results in the generation of 16 hot and cold categories based on significance in trends and clustering. Results from the EHSA show that dolphins exhibit persistent (90% of the time-step intervals are hot and stable) and intensifying hot spots (90% of the time-step intervals are hot and have become hotter over time). There was no apparent northward or southward shifts but distinct seasonal differences with (50%) core areas increasing from austral summer to winter. We conducted additional permutation-based MANOVA to verify significant results. The EHSA tool can be an effective tool to address broad-scale management-related needs. Although some parameters, e.g., neighborhood distance, are subjective and therefore, it is crucial to establish the scale of analysis derived from empirical observations.

HD19 Winter distribution of cetacean in Bulgarian Black Sea

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Data on cetacean abundance and distribution in Bulgarian waters of the Black Sea is scarce. During the winter months of 2015/16 from November to March several vessel surveys have been made in Bulgarian Black Sea waters aiming to collect data on cetacean distribution. In December-March, four surveys aboard RV Akademik of Institute of Oceanology, Bulgarian Academy of Science were made using it as platform of opportunity during hydro chemistry and plankton sampling surveys in 12-mile zone and part of EEZ. The sampling stations were fixed and identical in all 4 months making the route of the survey almost identical in all 4 months. Observations were carried out by trained volunteers throughout daylight from the ship's bridge (h=6 m) and distances and angle of sightings were measured using reticle binocular. Sightings and environmental data were recorded in field forms. Geographic coordinates of sightings and tracks of surveys were recorded by GPS (Garmin GPSMap 64s). During the four surveys total amount of effort was 2198 km covered in 190 hours and 19 minutes. Number of sightings were as follows: December – 9; January – 6; February – 18; March – 21. Most numerous were sightings of Black sea Common dolphin (Delphinus delphis ponticus) – 37, followed by Black Sea Bottlenose dolphin (Tursiops truncatus ponticus) – 13 while Black sea Harbour porpoises (Phocoena phocoena relicta) were observed only 4 times. In November and February two training surveys for volunteers were made in Southern sector of Bulgarian 12-mile zone using a motor sailing yacht. Total effort was 270.7 km covered in 38 hours 42 minutes. Total number of sightings were 31: Bottlenose dolphin – 24; Common dolphin – 3 and Harbour porpoise – 4. All three species have been detected during the November survey while in February Black Sea common dolphin was missing.

HD20 Distribution and abundance of bottlenose dolphins *(Tursiops truncatus)* on the south coast of Portugal

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Throughout the previous decades, human population growth has brought about several different threats to marine wildlife, and consequently, to accurately assess the health of affected populations it is critical to first obtain baseline knowledge on species abundance and distribution. The Photo-ID method is used worldwide, and its application is especially commonplace among cetacean populations, to estimate different demographic parameters through capture-recapture models. The study aimed to determine the population distribution, site fidelity and abundance of the bottlenose dolphin (Tursiops truncatus) in the waters of the Portuguese south coast, between 2009 and 2016. The data was collected in commercial dolphin-watching boats and by opportunistic encounters and also from a specially-dedicated research vessel. Through the collected data was possible to identified 549 individuals, creating a new catalogue for bottlenose dolphins present on the south coast of Portugal. The results show that the concentration of bottlenose dolphins on the Portuguese south coast was focused close to shore. Furthermore, because new individuals were identified in each year of the survey, one can argue that we are in the presence of an open population. The identified bottlenose dolphins also revealed low values of site fidelity, i.e., the studied area functioned as a local of passage or

migratory route. The abundance of individuals was never constant throughout the sampling years, according to both closed and open population models, and both types of model estimated the lowest population sizes in the years 2012 and 2013. Moreover, recapture probability under the Cormack-Jolly-Seber model, and capture probabilities under the Jolly-Seber model, were both low suggesting that individuals' home range has a much larger extension than the surveyed area. In summation, the study contributes to a better understanding of the bottlenose dolphin population in the south of Portugal.

HD21 Bottlenose dolphin ecotypes in the western South Atlantic: exploring the puzzle of dorsal fin shapes, colors and habitats

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Phenotypic variations occur in several cetacean species, including common bottlenose dolphins. Recently, two forms - coastal and offshore - have been described for the species in the western South Atlantic (wSA) based on osteological characteristics and genetics. Many gaps in the ecology of both forms exist, which are linked to the lack of effort in the full gradient of their habitats and the unclear recognition of these forms in the field. To search for distinguishable patterns, we examined dorsal fin shapes and coloration of photo-identified dolphins from 43 groups distributed in a wide geographic region off southeastern and southern Brazil, and described their habitat use. Firstly, multivariate techniques analyzed four dorsal fin indexes based on measures that reflect dorsal fin falcateness. A confident separation between coastal and offshore dorsal fins was found, with a more falcate shape for offshore dolphins. The presence of whitish areas in the tailstock and dorsal fin of the offshore form, differences of coloration in the throat region and a longer rostrum for the coastal form were also observed. There was a clear segregation of habitat use by them, with the coastal form inhabiting a narrow strip of close to shore and shallow waters. Coastal dolphins were frequently found in inshore bays, rivers, and lagoons. The offshore form has a wider distribution and more flexible habitat use. Offshore dolphins may approach the coast resulting in an overlap zone of occurrence. The results indicated that both forms can be visually distinguished in the field due to their distinct morphology and color patterns. Moreover, segregation of habitat between the forms suggests they are truly ecotypes. The strong evidence of habitat segregation, parapatric distribution and distinct morphology between the coastal and offshore ecotypes support the description of two subspecies of bottlenose dolphins for the wSA.

HD22 Modelling the distribution of Delphinus delphis in the eastern Aegean Sea: identifying the key variables in their habitat

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The subpopulation of the Short-beaked common dolphin, Delphinus delphis, in the Mediterranean is classified as Endangered under the IUCN Red List of Threatened Species. The decline of Delphinus delphis is highlighting the nee for more studies of their distribution in order to determine the areas of importance for this species, where management measures should be taken. However, studying the distribution of cetaceans can be challenging as they spend most of the time under the water and their habitat is prone to spatial and temporal changes. This research is based on the eastern Aegean Sea, Greece in the waters between Samos and Lipsi islands. This marine area is on the plateau platform inhabited by many species of cetaceans, but there is little information about their populations. For that reason, this study developed a species distribution model by maximum entropy (MaxEnt). The model was created from sightings collected during surveys from February to June throughout 2016 and 2017 and combined different environmental variables collected from satellite images. The environmental variables selected were slope, distance to shore, depth, pH, chlorophyll-a concentration and sea surface temperature. The model created is an average measure of 10 replications. This model is considered a good predictor due to its high value of AUC = 0.8575±0.0674 and it matches the distribution of the species in the study area. Furthermore, the model allowed to identify that topographic variables such as distance to the shore and slope, are the main variables affecting the distribution of this population. The present study contributes

a better understanding of the ecology of the species, as well as of the sites of importance for this population, which will enable the development of more efficient conservation measures.

HD23 Complex temporal distribution of fin whales and sei whales in the Azores

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In the last 10 years in São Miguel Island, Azores, we have sighted 6 different species of baleen whales (Suborder Mysticeti). Regarding fin whales and sei whales, most of the encounters have been recorded during spring (74.3%, 67.7%), but others have been seen in other seasons too (winter: 7.4%, 1.1%; summer: 15.4%, 22.9%; autumn 2.9%, 8.3%). This makes us think that the general baleen whale migration patterns for these species are overly simplified. The theory indicates that during winter time, baleen whales breed in low latitudes, while in summer they are usually found in higher latitudes, where food is abundant. We collected cetacean encounter data from a whale watching platform between 2008 and 2017 off São Miguel. Our results for fin whales show a clear preference for spring time. It is highly remarkable the high number of sightings in 2014, 2016 and 2017 compared to the other years. It is also notable that there was an increased number of records the last three summers (2015-2017), suggesting a delay in their timing. Regarding sei whales, preferences go for late spring to mid-summer. In 2017 most sightings occurred in autumn (41.3%), although they were sighted from late march every single month until December. Other studies in the north Atlantic had pointed out similar results, sightings out of the expected seasons. All those findings suggest that the temporal distribution of these whales species in the North Atlantic is more complex than previously thought. Hence, more research is needed in order to answer the questions arising from this study. Different whale stocks can choose different migration strategies. Maybe not all the fin/sei whales are travelling long distances every season, which could suggest different periodicity for individuals that are not yet sexually mature or reproductive or perhaps relate their journeys to the food availability.

HD24 Spring and summer cetacean abundance and distribution for romanian territorial waters using line transect sampling method

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Cetacean abundance is estimated for the Romanian territorial waters (12 NM) between Constanta and Vama Veche based on a ship line-transect survey for March and June, 2017, using distance sampling method and Distance 7 software for survey plan design and data analysis. Distance sampling, which takes undetected individuals into account, is one of the most widely used method for generating population estimates. The European Union Habitats Directive requires Member States to monitor and maintain at favorable conservation status those species identified to be in need of protection, including all cetaceans. That is why the studies related to Black Sea cetaceans are of great importance, keeping in mind the important role of cetaceans in the marine ecosystem. The survey plan covered 8 transects, from East to West with a distance of 5 Km between, perpendicular on the shore line summing 211.95 Km and was conducted ≤ Beaufort 4 in an area of 1063 Km2, with a coverage of 0.396%. In total there were 59 sightings for March and 216 sightings for June, of all the three species of cetaceans known for the Black Sea with a low frequence of common dolphins (Delphinus delphis ponticus). The assessment was done in the frame of the project "Increase the regional capacity for developing cetacean distribution and abundance studies" financed from the Supplementary Conservation Funds of ACCOBAMS.

HD25 Influence of environmental factors on the spatial distribution of two cetacean species: Common bottlenose and short-beaked common dolphins in the eastern Aegean Sea

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Due to the variety of cetacean species inhabiting its waters, the Aegean Sea is considered to be an incredibly important marine zone. This study focuses on two dolphin species which are facing an important population decline and are becoming conservation priorities within the Mediterranean Sea: the short-beaked common dolphin (Delphinus delphis) and the common bottlenose dolphin (Tursiops truncatus). Studying the spatial distribution of these cetaceans can provide crucial habitat data which is essential for the design of efficient conservation strategies. Many factors are known to influence the spatial distribution of cetaceans, however, there is still a lack of information regarding the environmental determinants related to T. truncatus and D. delphis distribution. A quantile analysis, as well as an habitat modelling, are applied to determine whether the selected variables influence the distribution of the two species within the study area. Eight environmental variables are included: distance from the shore, slope, depth, sea surface temperature, salinity, chlorophyll-a and water visibility. GAM is the most accurate habitat modelling technique for D.

delphis. The preliminary results have shown, for the first time, a preference for the species D. delphis toward areas close to the shore (<4km) with a very gentle slope (<1.3°). The modelling is also performed for T. truncatus, for which however no reliable results were found. Expanding the study to include different seasons and a wider habitat range will allow for greater characterization of this critical habitat. Further studies are required for the development of better conservation measures for these two species.

HD26 Modelling the distribution of odontocetes in the four island region of Maui, Hawaii using platform of opportunity data

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Effective management of anthropogenic influence is dependent on reliable information regarding the overlap between distribution and habitat use of the target species and the anthropogenic activities it is vulnerable to. The four most commonly sighted odontocete species in Maui County, Hawaii, USA are bottlenose dolphins Tursiops truncatus, Hawaiian spinner dolphins Stenella longirostris longirostris, Pantropical spotted dolphins Stenella attenuata and the endangered insular population of false killer whales Pseudorca crassidens, all of which possess documented vulnerabilities to human activity but lack detailed information about spatial and temporal distribution dynamics. Sighting and location data collected aboard platforms of opportunity were analysed to assess the distribution of these four species in Maui County, Hawai'i. We used a cross-validated maximum entropy (maxent) modelling approach for all four odontocete species for pods with and without calves, and Poisson GLMs to investigate model similarity and seasonal dynamics. Significant maxent models (AUC > 0.7) revealed a complex interaction of variables driving distribution patterns, which differed for all species when calves were present. The results demonstrate an overlap in the distribution of the study species and areas with a high density of vessel traffic in the Alakakeiki and Au'au channels. Poisson GLMs showed a significant relationship between the relative occurrence rates of pods with calves and pods without. Standard errors and residual values in these models indicated a weaker relationship in areas with a higher likelihood of pods with calves occurring. The number of sighting events of all species varied significantly by season, with T.truncatus and P.crassidens more prevalent in winter, while the inverse was the case for both Stenella species. This study establishes the relevance of models trained using platform of opportunity data and shows the utility of such data to model and assess anthropogenic threats to marine mammals.

HD27 Spatial and temporal distribution of the short-beaked common dolphin (Delphinus delphis) in NW Spain

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The short beaked common dolphins (Delphinus delphis) is the species of cetacean most commonly seen in the NE Atlantic. Recent studies such as the CODA and SCANS III surveys and other surveys carried out in the early 2000s, showed that the waters off NW Spain are an important area for the species. However, there is a lack of information on habitat use and fine-scale distribution of the short-beaked common dolphin along the Galician continental shelf. At the same time, Galician waters support the largest fishing fleet in Spain, which exerts an intense fishing pressure on the coastal and semi-pelagic ecosystems. Thus, knowing the distribution and the habitat use of the species is a crucial first step to develop conservation and coastal management measures. This study explores the distribution of the short-beaked common dolphin in waters above the continental shelf in South Galicia, NW Spain. Data collection took place in the Arousa Firth and adjacent Atlantic waters from January to October 2017 along 65 dedicated boat surveys, covering approximately 2085 nm during 352 hours of observation. A total of 75 sightings were recorded in both the Arousa Firth (8%) and adjacent Atlantic waters (92%). Mean group size was 43.72 ± 8.43 (1 – 400) and the mean depth at which the groups were sighted was 141 ± 15.23 (7.8 – 950). GIS software was used to assess the distribution and habitat use of the short-beaked common dolphin in the area and to analyse differences in the seasonal distribution. This study aims to provide baseline data and information on the distribution and habitat use of the short-beaked common dolphin in the area that could be used in further studies.

HD28 Impact of gillnets and seine fisheries on bottlenose dolphin's distribution in the Ría of Arousa, NW Spain

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The interaction between cetaceans and gillnets and purse seine fisheries is common in European waters. Along the NW Spain, more particularly the Ría of Arousa, there is a resident population of common bottlenose dolphins in an area characterized by high fishery activities. The aim of this study is to determine if fisheries activities could affect on the distribution of common bottlenose dolphins in the Ría of Arousa, NW Spain. Boat based observations onboard the

BDRI research vessel were carried out from July to October 2016. A GIS analysis was performed in order to illustrate the distribution of bottlenose dolphins, gill nets, and seines in the study area. A Spearman correlation was calculated to determine if a correlation exists between either the distribution of bottlenose dolphins and gill nets, or the distribution of bottlenose dolphins and seines. According to the results of this analysis, the distribution of bottlenose dolphins is negatively impacted by the presence of seines ($P<0.01$; Spearman rs = -0.70854), but is not impacted by gill nets ($P>0.05$; Spearman rs = -0.47474). This study provides new information on the distribution of bottlenose dolphin in an anthropogenic coastal ecosystem, which is linked to the distribution of prey. In future studies, it would be interesting to include data from each season over the course of multiple years as a means of maximizing the information acquired in order to further contribute to the conservation of this species.

HD29 Inter-annual variability of the distribution of fin whale (Baleanoptera physalus) and sperm whale (Physeter macrocephalus) in the Western Mediterranean Sea: 12 years of data

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In the Western Mediterranean Sea, the fin whale (Baleanoptera physalus, Linnaeus 1758), considered vulnerable by the IUCN, and the sperm whale (Physeter macrocephalus, Linnaeus 1758), classified as endangered, occur regularly even though several human activities threaten them: vessel collisions, bycatch in fishing gear, different type of marine pollution and disturbance related to the intense marine traffic. Purpose of this work was to find possible inter-annual variabilities in the distribution of both species and find "hot spots", to identify critical areas that need greater protection and management. The study area is a region of the Western Ligurian Sea, inside the Pelagos Sanctuary, the main ASPIM of the basin, that has several oceanographic and climate unique features, in comparison with the rest of the Mediterranean Sea. Data were collected, from 2003 to 2014, using whale watching boats as platform of opportunity, and then analysed with the geostatistical approach of kriging, to obtain for each species and for every year a map showing areas with higher probability of sighting. In 12 years of data collection, 627 sightings of fin whales and 287 of sperm whales were recorded, confirming how this area is certainly important for cetaceans' ecology. Results of the fin whales' analyses showed a clearly inter-annual variability in the distribution of the hot spots and in the number of sightings, very likely linked to the highly changeable (spatially and temporally) oceanographic parameters influencing its distribution, like as the concentration of chlorophyll-a. Sperm whales showed a less inter-annual variability. Their hot spots were located in the continental slope and nearby submarine canyons, fixed structures where they can find their preys. This study shows how the techniques of kriging is useful to create georeferenced maps related to cetaceans' spatial distribution, which results could be used to create conservation plans.

HM HEALT & MEDICINE

HM01 Investigating the persistent organic pollutants in cetaceans. Preliminary data on dioxin burden in the blubber of bottlenose dolphins *(Tursiops truncatus)* stranded along Adriatic Sea coastline

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Despite their ban since 2001 by the Stockholm convention, dioxins and dioxin-like compounds were referred as persistent organic pollutants in terrestrial environments including food and feed contamination during local environmental disasters (burning of wastes, illegal releases). Even if their contribution to the cetacean stranding occurrence could not be evaluated, data on dioxin load of bubblers reveals that the marine environment is not exempt from dioxin pollution. Since 2014, within the National Cetacean Stranding and Health Surveillance Network, organ samples from specimens stranded along the coastline of Abruzzi and Molise regions (Adriatic Sea, Central Italy) were stored for retrospective studies. As the blubber is the site of lipid bioregulation (storage, mobilization), this material is commonly used to evaluate the lipophilic chemical compounds load in stranded or free ranging cetaceans. The toxicologically relevant 7 Polychlordibenzo-p-dioxin (PCDD) congeners, the 10 Polychlordibenzofuran (PCDF) congeners and the 12 dioxin-like polychlorbiphenyl congeners (DL-PCB) were investigated in the blubber of the six bottlenose dolphins (Tursiops truncatus) stranded in 2014. All analyses were performed according to U.S. Environmental Protection Agency methods. The overall toxicity of analytical products was calculated as Toxicity Equivalent Quantity (TEQ) according to World Health

Organization recommendations. The average of the blubber PCDD/PCDF TEQ in the six bottlenose dolphins was 0.47 pg/g whole weight (median, 0.35 pg/g ww). The average of DL-PCBs TEQ was 35.78 pg/g ww (median, 33.02 pg/g ww), indicating that the dioxin-like PCBs contributed for 98.7% to the total dioxin burden of the investigated specimens. Although additional investigations need to better evaluate the relevance of dioxin load in the bottlenose dolphin, this preliminary data indicates a minor proportion of PCDD/PCDF (1.3% of total dioxin burden) in this species compared to similar analytical outcomes reported by studies from blubbers of whales, where the proportion ranged from 10 to 20%.

HM02 Development of technique for post-mortem external cerebrospinal fluid (CSF) collection in cetaceans

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Cerebrospinal fluid (CSF) is a valuable post-mortem diagnostic sample for cytology and detection of infectious viral, bacterial and fungal pathogens, such as Brucella and Morbillivirus. Collection of CSF is typically done during post-mortem examinations by dissecting down through the cervical blubber and muscle to access the spinal canal. However, when timely post-mortem exams are not possible, a simple and reliable method for obtaining CSF externally is needed for time-sensitive analyses such as polymerase chain reaction. A technique was developed and tested on large and small cetaceans and proven to be an effective method for external extraction of CSF. This procedure has been used successfully to collect post-mortem CSF from harbor porpoises, common dolphins, Atlantic white-sided dolphins and minke whales. In the majority of cases, the sample was free of blood and in several cases, samples submitted within appropriate time constraints were viable for quality cytology analysis. This procedure is a useful tool to gain additional information that may be the key to making cause of death or final diagnosis determinations, and may also be useful in additional disease surveillance.

HM03 Improving detection of cetacean morbillivirus in South Atlantic cetaceans

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Morbillivirus (Paramyxoviridae) is a re-emergent pathogen associated with severe epizootic outbreaks causing high number of deaths among pinnipeds and cetaceans. Recently the virus was associated with fatality involving a stranded Guiana dolphin (Sotalia guianensis) in Brazil (South Atlantic Ocean). Partial sequence of the viral phosphoprotein gene and phylogenic analysis showed that the Guiana dolphin morbillivirus (GDMV) shared only 79% of nucleotide and 58% of amino acid identities with other cetacean morbillivirus (CeMV), suggesting that the virus might represent a new lineage of CeMV. This study aimed to develop an effective molecular technique for screening of morbillivirus, capable to detect the three major variants of CeMV of the Atlantic Ocean: GDMV, dolphin morbillivirus (DMV) and pilot-whale morbillivirus (PWMV). Viral RNA was extracted from lung of a GDMV-positive Guiana dolphin, laryngeal tonsil of a DMV-positive bottlenose-dolphin (Tursiops truncatus), lymph node of a PWMV-positive short-finned pilot whale (Globicephala macrorhynchus) and brain of a canine distemper virus (CDV)-positive dog. Sequences of DMV, PWMV and GDMV were aligned, most conserved regions of the phosphoprotein gene were selected, primer sets were generated using the Primer 3 software and tested by computer simulations using Primer BLAST program (NCBI). The final three primer sets, targeting a fragment of the CeMV phosphoprotein gene, were selected to test field samples by means of a real-time reverse transcription polymerase chain reaction (real-time RT PCR) method based on SYBR® Green. The three selected primer sets were able to effectively amplify morbillivirus variants from cetaceans and from a dog infected with CDV. The methods developed were standardized at the Institute for Animal Health, Canary Islands (Spain), validated through genetic sequencing and sensitivity was studied performing serial dilutions. We believe this method may be suitable for screening studies of known and possible novel morbillivirus variants in South Atlantic cetaceans. (CAPES/ FAPESP 2014/24932-2; 2015/05043-5; 2015/05043-5).

HM04 Beta amyloid peptide and phosphorylated tau protein expression in the frontal cortex and cerebellum of the toothed whales: preliminary observations and future directions

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Cetaceans are homeotherms, long-lived top predators, which are at high risk from bioaccumulation and biomagnification of a variety of organic and metallic pollutants. Neurodegenerative diseases, such as Alzheimer's disease (AD), should be investigated in these animals and considered as a possible cause of stranding. In the present study, we show the preliminary results on the beta amyloid (Aβ) peptide and phosphorylated tau protein expression, the pathological hallmarks of AD, in different species of toothed whales. Beta-amyloid is a 40–43 amino acid peptide cleaved from amyloid precursor protein, and a putative gamma-secretase. It is a major component of the extracellular plaques found in AD brain tissue. Neurofibrillary tangles (NFT) are made up of paired helical filaments, which are insoluble structures composed of a highly phosphorylated form of the microtubule-associated protein tau, and associated lipids. In this study, cerebral and cerebellar were obtained from 9 specimens of 6 different species of the suborder Odontoceti, stranded in the Canary Islands between 2001-2017: the Cuvier's beaked whale (Ziphius cavirostris), the Blainville's beaked whale (Mesoplodon densirostris) (n=2), the short-finned pilot whale (Globicephala macrorhynchus), the Risso's dolphin (Grampus griseus), the bottlenose dolphin (Tursiops truncatus), and the Atlantic spotted dolphin (Stenella frontalis) (n=3). Animals were classiefied as adults (n=6), adult-old (n=1), subadult (n=1), and calf (n=1). Sections were stained with thionine and congo red, the most popular dye used as a probe for diagnosing amyloidosis also in AD brains. The immunoperoxidase staining procedure was carried out on free-floating sections. The antibodies used were a monoclonal anti-beta amyloid antibody and a policlonal anti-NFT antibody. In 5 out of the 9 animals immunopositivity to one of the two antibodies was observed, showing typical and atypical hallmarks of neurodegenerative disease and raising more questions on these animals.

HM05 First Assessment of organochlorine levels in three different cetacean species in the Greek Ionian Sea

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As persistent organic pollutants (POPs), hexachlorobenzene (HCB), dichlorodiphenyltrichloroethane (DDT) and its metabolites and polychlorinated biphenyls (PCBs) are still found in marine biota. Levels of these xenobiotic compounds are higher in the Mediterranean Sea than in other areas, and even within this semi-enclosed basin some differences are noticeable. Between 2016 and 2017, with the aim of producing the first assessment of organochlorine levels in dolphin species present in the Greek Ionian Sea, biopsy samples were collected from free-ranging striped dolphins (Stenella coeruleoalba; n=23), common bottlenose dolphin (Tursiops truncatus; n=5) and short-beaked common dolphin (Delphinus delphis; n=5). These samples were taken using either a crossbow or a 3 m long telescopic pole. The tip used by both, bolts and pole, had a high-pressure moulded stopper to prevent it from penetrating more than about 20 mm. The levels of 30 PCBs congeners, DDT and its metabolites and HCB were evaluated in the blubber of each specimen. Our results showed that the HCB levels were higher in bottlenose dolphins (187,70 ng/g lipid weight (l.w.)) while DDTs and PCBs levels were higher in striped dolphins (41445,65 ng/g l.w.; 27084,49 ng/g l.w.). Among PCBs, the highly chlorinated IUPAC number 180, 153 and 138 were the predominant congeners, while among DDTs was pp'DDE. The relation between pp'DDE/pp'DDT and pp'DDE/DDTs indicates that DDTs levels were consequence of a remote introduction of this pesticide. The ratio between op'DDTs/DDTs in striped dolphins suggests the presence of an industrial form of DDT. PCBs levels in all three species were lower than those found in different areas of the Mediterranean Sea. The predominance of DDTs, in striped dolphins suggests a higher contamination from agriculture than from local industries. Our findings are consistent with the proximity of the largest agricultural system of the Epirus region (North-west Greece).

HM06 How do organic pollutants affect seals' health? A review

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Persistent organic pollutants (POPs) tend to bioaccumulate and biomagnify in the adipose tissue of marine top predators. In high concentrations, they may induce harmful effects on marine mammals' endocrine, immune and reproductive system, which can lead to negative impacts at the population level. However, the reduced number of studies available at present time hinders the development of informed conservation strategies and government decisions. Hereafter, we review available research on the direct effects of POPs on seals' health, with the aim of identifying main risks for seal populations and highlighting scientific gaps in this field. We assessed 35 publications, dating from 1976 to 2016. Among the studied POPs, only PCBs and DDTs have been clearly linked to effects such as immunosuppression, reproductive failure and endocrine disruption in seals. Other issues such as bone lesions or tumor development are barely documented. There is a great bias in the target species and the geographical range of study: harbor seals (Phoca vitulina) are present in >55% of studies whereas only Northern Hemisphere environments are addressed. Further research on a larger array of contaminants, species and health effects is needed to reinforce existing information and provide a solid base for conservation strategies and government decisions.

HM07 An overview of current issues in seal rescue and rehabilitation in the U.K.

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In recent years, a variety of factors have led to an increase in the number of seals that are being reported to British Divers Marine Life Rescue that may need rescue, such as more year-round tourism to coastal areas and greater awareness of awareness of the marine environment. Meanwhile, there have also been apparent changes in trends of why more animals are being admitted for rehabilitation, which is creating issues with national seal rehabilitation capacity. Common seals (Phoca vitulina) along the East coast of England have increasingly been admitted to rehabilitation with severe health issues, with the survival rate in some rehabilitation centres decreasing from 50-60% to 25-45% within a few years. Since 2013, grey seals (Halichoerus grypus) have been significantly affected by the increasing frequency and severity of storms during Autumn and Winter that coincides with their pupping season, with reported losses in some colonies of 70% of pups overnight. Entanglement in marine litter is a significant ongoing concern that recent increased public awareness has meant BDMLR has been able to partner with many other NGOs and commercial organisations to provide information for campaigns on this issue. In addition to this there are the ongoing negative interactions of fisheries, fish farming and leisure angling with seals, but also a manufactured problem from tourist fishing trips feeding wild seals, which has resulted in long-term habituation of individuals that then spend a lot of time within working harbour environments and have become victims of both intentional and unintentional harm. This presentation will look in more detail at these issues and others such as interactions with the marine renewables industry from BDMLR's national perspective, to illustrate the problem areas and how future strategic planning and collaboration is required to solve them.

HM08 Twelve fatal weeks – elevated grey seal (Halichoerus grypus) casualties in the German Baltic Sea in autumn 2017

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Twenty-three dead grey seals were found in the southeast of the island Rügen (Germany) from 10th September to 4th December 2017. In the same period from 1997 to 2016, a combined number of only 30 grey seals were found along the whole coast of Mecklenburg-Pomerania with a maximum of 8 seals in 2014. Most carcasses, mainly juvenile grey seals, are usually found in May and June and not in autumn. Although grey seal numbers in this area have increased the current casualties exceed expected numbers by far. In the same area the maximum count of live grey seals was below 100 animals in October 2017, which would suggest that around 25 % of the local population died within that time frame. Maximum distance between the stranding localities was less than 15 km. Both major resting sites for grey seals, the Stubber Bank (~10 km) and the island Greifswalder Oie (~20 km) in the German Baltic Sea are located close-by. In summary 19 of the carcasses were recovered and 14 were pathologically investigated until now. All individuals were subadult or adult males, above 2 m length, in good nutritional status and showed no or few signs of decomposition in contrast to regular strandings that typically show advanced decay. All investigated animals died of acute cardiovascular failure and didn't show any unusual physical trauma. Virological and bacteriological investigations

didn't reveal clear pathogens causing the deaths, although lymph nodes were enlarged in most animals. Most animals showed mild infestations of acanthocephalans and nematodes that didn't cause the deaths. Intensive toxicological investigations were negative as well. Now possible relationships to local constructions work or fishing effort will be further investigated, since the unusual high number of strandings without clear pathological findings so far suggests impacts of anthropogenic activities impacting grey seals in this area.

HM09 Pup mortality of the Mediterranean monk seal (Monachus monachus) at Cabo Blanco peninsula

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The Mediterranean monk seal is an endangered species with its largest known colony located at Cabo Blanco peninsula (Mauritania/Morocco). From 2000 to 2015, 731 pups were born in this population. 275 died before reaching two months of age. Pup mortality rate varied annually ranging from a minimum of 26% to a maximum of 46%. 49% (135) of those 275 pups died during their first week of life (60 females, 60 males and 15 individuals of unknown gender). As pups grow older, the number of deaths decrease. This high pup mortality during the first week of life, could mostly be due to the fact that the females of this colony breed at a suboptimal habitat: the inside beach of three marine caves that are exposed to strong swell and that during high tides and rough sea conditions, those beaches can be completely covered by the water. This high pup mortality is slowing down the progressive recovery of this monk seal endangered population. To reverse this situation, it would be positive for the colony to start breeding at open beaches. The reserve "Costa de las Focas" protects not only the breeding caves of this population, but also some open beaches, preventing any source of human disturbance. Nevertheless, an enlargement of the reserve to the south to protect more open beaches would be positive to increase the surface of this habitat available for breeding, and therefore the chances to be used in the future by reproductive females.

HM10 Uncinaria sp. (Nematoda: Ancylostomatidae) Infestation in Mediterranean monk seal from Eastern Mediterranean coast of Turkey

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The Mediterranean monk seal, Monachus monachus (Hermann, 1779), is an endangered species according to International Union for the Conservation of Nature (IUCN) Red List. On 25 November 2017, a female monk seal pup was found stranded on the coast of Antalya/Kaleiçi. Due to field conditions, the carcass was preserved in -20ºC and the necropsy was carried out after three days. Its length was 124 cm from nose to hind flipper end, 113 cm from nose to tail end, body weight was 24.5 kg and blubber was 1.3 cm thick on average. Second left incisive tooth was visible. Based on these findings, the age of the seal was predicted <3 months. There were some marks around the head and flipper which might have been caused by net entanglement. Although macroscopic findings such as hemorrhagic lungs and intestines suggested septicemia, due to the preservation condition, detailed histopathological examination were not possible. Virological samples were collected for further examinations. The stomach was empty and intestinal content was milky. All organs examined for parasites and heavy infestation of adult Uncinaria sp. (Nematoda: Ancylostomatidae) was observed in intestines. The infestation mainly found in small intestines and some of the hookworms were attached on the intestine wall. According to literatures, the hookworms can be transmitted transmamary. Uncinaria sp. reported for the first time from the Turkish coast.

HM11 Crassicauda sp. infestation in Cuvier's beaked whale, Ziphius cavirostris from Eastern Mediterranean coast of Turkey

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On 14 November 2017, a male Cuvier's beaked whale, Ziphius cavirostris, stranded on Çamyuva, Kemer/Antalya, the Mediterranean coast of Turkey. Its body length was 479 cm and its blubber was 3.8 cm thick on average. Bleeding around the head and broken incisive teeth were observed in external examination. Necropsy was carried out after one day. Hemorrhage and cestode infestation were present in the intestines and congestion. Hemorrhage and white

granulomatous lesions were present in the kidneys. Nodules excised from the renal lobe revealed the presence of nematodes. Parasites found in the renal nodules were identified morphologically. Previous researches reported Crassicauda sp. from the western Mediterranean coast and mentioned that Crassicauda sp. prevalence is high in the Cuvier's beaked whale. Crassicauda sp. is reported for the first time from the Turkish coasts. In other species of the cetaceans, Crassicauda sp. has been reported as a cause of mortality among adult individuals. However, parasitological information of the Cuvier's beaked whale, is not well known. Epidemiological data may show differences due to biased sampling of infected animals, thus, necropsies should be done as soon as possible and carefully in stranded specimens.

HM12 Genital hypoplasia in a striped dolphin (Stenella coeruleoalba) stranded in Northern France

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Gonadal hypoplasia has been described in case of hermaphrodism. In cetacean, two cases of hermaphrodism have been reported: a beluga whale Delphinapterus leucas found in the St. Lawrence Estuary, Quebec, Canada and a common dolphin Delphinus delphis stranded on the southwest coast of the UK. The two cases were considered as true hermaphrodism as two testicles and two separate ovaries were observed for the beluga while one ovotestis and a contralateral ovary were reported for the dolphin. In July 2017, an adult striped dolphin (Stenella coeruleoalba) stranded alive in Northern France, displaying swimming disorders compatible with a neurological syndrome. Different attempts were made to refloat the animal and finally the dolphin was euthanized. Externally, the phenotype was a female with a caudal genital slit separated of the anus by two mammary gland slits. The dolphin weighted 63 kg and was severely emaciated. At the necropsy, no mammary gland tissue was reported under the slit while a micro-penis (18 mm) was present in the genital slit. Macroscopically, gonads could not be identified, only a 20 mm on 5 m organ was present unilaterally on the left abdominal wall at the place of gonads. Samples have been collected for histology, microbiology and genetic analysis. Under the microscope, the most significant observation was a severe non-suppurative meningo-encephalitis. The organ on the left abdominal wall was a testis that exhibited complete hypoplasia without spermatogenic activity. The sex was genetically identified as a male. The animal was negative for Morbillivirus and Brucella. The origin of the penis and testis hypoplasia and the absence of contralateral gonad could not be determined and are considered as being congenital. For terrestrial mammals, such congenital defects could be associated in utero pathogens exposure such as toxics and infectious microorganisms.

HM13 Seasonal variations in girth measurements of individual harbour porpoises *(Phocoena phocoena)*

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Blubber is an essential tissue involved in thermic insulation and energetic reserve. In cetaceans, blubber thickness is influenced by many different factors, including season, age, sex, reproduction activity and health status. Measuring their circumference (girth) is one way to quantify how much blubber they build up according to the time of year and their physiological state. The girth may also be used in the estimation of the nutritional status which is partly reflected in the blubber thickness. However, seasonal individual variations in girths of cetaceans are difficult to measure in free-living animals, and usually these data can only be obtained once from captured or dead individuals. Furthermore, such data is a snapshot from single animals and not a full overview of individuals' seasonal variations in body conditions

throughout their lives. Here we use nine years of monthly collected data from five harbour porpoises (Phocoena phocoena) kept under human care in natural water condition and in a semi-open facility at Fjord&Bælt, Denmark. Consistent measurements of girths from six different places of the body, nine different blubber thickness locations, length, sex and age, were compared to body proportions and the water temperature to explore seasonal patterns of girth, blubber thickness and length, related to growth. The preliminary results show, that the water temperature, the length and the age can be used to determine the growth rate and four out of six girth measurements of the animals. It is possible to estimate the different blubber thicknesses from the girth measurements. This long-term longitudinal data from individuals show that with just a few measurements, it is actually possible to determine an overview of the body condition, a valuable complement for understanding the seasonal energy requirements of harbour porpoises.

HM14 The snowball effect of loosing body mass: diving and health implications

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The body condition of an animal is an index that provides information about the individual's health. An estimation used for body condition determination is the relationship between length and weight. In the current study, we studied the relative distribution of tissues (body composition) in different species of cetaceans to assess what occurs when an animal is in poor body condition, and how this affects body composition. We performed mass dissections in several species (Stenella coeruloalba, Delphinus delphis, and Mesoplodon densirostris) with different body conditions. Our results indicated that animals in poor body condition lost both, blubber and muscle mass. The animal with the worst body condition lost 52% of blubber mass and 49% of muscle mass. As the mass-specific metabolic rate increases with a decrease in body mass, the loss in body mass in the animal with the poorest body condition would have resulted in an increase of mass-specific basal metabolic rate of 61%. With a concurrent reduction in relative muscle mass, and therefore a reduction in oxygen muscle mass storage (49%), this would result in a decrease in the aerobic dive limit of 48%. Consequently, changes in body condition would alter the diving capacity and foraging efficiency with the animal having to spend more energy to obtain the same amount of prey at a higher energetic cost, resulting in greater body mass loss. Our results show that body condition has direct implications for body composition and body compartments. The studied animals presented a poor body condition. More extreme results should be expected for animals in very poor body condition. Further studies should be performed in more species, and in a larger sample size. The implications of body condition in the dive capabilities merits further investigations.

HM15 Haematology and Serum Biochemistry of Harbour Seal (Phoca vitulina) Pups after Rehabilitation in the Netherlands

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Haematology and serum biochemistry are techniques used to determine the health status of animals ongoing rehabilitation at the Sealcentre Pieterburen. This project was developed to determine the normal haematology and biochemistry values for pups of the common seal (Phoca vitulina) at the moment of the release. All the animals stranded along the coast of the Dutch Wadden Sea and were admitted to rehabilitation during the months of May and June 2016. We evaluated 22 different blood values in 60 different animals. The aim was to test for differences due to sex, geographic location, and presence or absence of umbilical cord; and to develop reference ranges. A comparison between the values used at the centre and the values established by this study was made. Red blood cell distribution width ($p=0.017$), mean platelet volume ($p=0.002$), alkaline phosphatase ($p=0.023$), total protein ($p=0.006$), and glutamate pyruvate transaminase ($p=0.006$) differed significantly between males and females. White blood cells and lymphocytes ranges were lower compared to the ranges used at the centre. ALP, GPT, and BUN had new ranges greater than the ones previously used. Creatinine ranges were lower than the ones present at the centre.

HM16 Severe jaw injury in a common bottlenose dolphin (Tursiops truncatus) from the Gulf of Trieste, northern Adriatic Sea

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Cetacean injuries provide insights into various threats, including fishery interactions, boat strikes, predators, etc. We documented a severe upper jaw injury in a common bottlenose dolphin (Tursiops truncatus), during a long-term study of bottlenose dolphin population ecology in the wider area of the Gulf of Trieste, Adriatic Sea. The dolphin, first photo-identified in 2013 and part of a well-known resident population, was first observed with an injury in August 2017, missing a substantial part of the upper jaw. The injury left lower teeth and the tongue exposed. There were no other visible wounds. The dolphin was part of a well-known group of 6 dolphins, behaving normally as compared to other dolphins. Prior to this, the dolphin was last observed in March 2017, with its face still complete, and in apparently good health. The injury therefore occurred between March and August 2017. The dolphin was seen in 6 subsequent sightings, in group sizes of 6–10 dolphins. Its behaviour did not deviate from behaviour of other dolphins. The dolphin showed no signs of emaciation and was even observed leaping clear out of the water. The cause of injury is unknown. Likely causes include intraspecific interactions, boat strike or fishery interaction. Previous research showed that fishery interactions are common in this population. Of 10 recorded sightings in 2017 in which this particular dolphin was present, 4 included an interaction with bottom trawlers. The dolphin was regularly observed actively following operating trawlers both before and after the injury. It is therefore possible that the injury was the result of one of such interactions. Dolphins have been known to survive and even reproduce after serious injuries. Although the dolphin appeared in good condition, it is unknown how this injury might affect its life. Further monitoring in the following months will provide further clues.

HM17 Immunohistochemical investigation of the cross-reactivity of selected cell markers in formalin-fixed, paraffin-embedded lymphoid tissues of Franciscana *(Pontoporia blainvillei)*

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A considerable amount of knowledge on natural and anthropogenic pathologic conditions affecting different cetacean species has been gained over the last decades. Nonetheless, the immunopathological bases for most of these processes have been poorly documented or remain unknown. Comparative immunopathological investigations in these species are precluded by the limited number of specific antibodies, most of which are not commercially available, and the reduced spectrum of validated and/or cross-reactive ones. To partially fill in this gap of knowledge, a set of commercially available primary antibodies (pAbs) were tested for cross-reactivity against leukocytes and cytokines in formalin-fixed, paraffin-embedded (FFPE) lymphoid tissues (lymph nodes, spleen and thymus) of three bycaught, apparently healthy and fresh Franciscanas (Pontoporia blainvillei) using immunohistochemistry. On the basis of similar region specificity within the lymphoid organs, cellular morphology and staining pattern with human control tissues, 13/19 pAbs (caspase 3, CD3, CD57, CD68, FoxP3, HLA-DRα, IFNγ, IgG, IL4, IL10, Lysozyme, TGFβ and PAX-5) exhibited satisfactory cross-reactivity. Our results expand the spectrum of suitable cross-reactive pAbs in FFPE cetacean tissues. Further comparative immunopathological studies focused on infectious diseases and ecotoxicology may benefit from establishment of baseline expression of immunologically relevant molecules in various cetaceans species.

HM18 Pyogranulomatous encephalitis associated with cerebral trematodiasis in a Blainville´s beaked whale *(Mesoplodon densirostris)*

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A 454 cm length and 814 kg weight, adult female Blainville´s beaked whale (Mesoplodon densirostris), was found death in Fuerteventura, Canary Islands. A complete necropsy was performed. The animal was in a poor body condition and the carcase was fresh. The most relevant finding during the necropsy was a severe chronic-active multifocal pyogranulomatous encephalitis. Macroscopically, multifocal, tortuous, irregular, well-defined, yellow-green lesions, between 1.3x2 and 4x3.5 cm sized, affecting the cerebral cortex parenchyma of the orbital lobe and thalamus.

Histologically, multiple areas of encephalomalacia, granulation tissue, multifocal haemorrhages with intralesional adult trematode parasites (evident cuticle, musculature with calcareous corpuscles, without a pseudocelomic cavity and a differentiated digestive tract) and triangular refringent yellow eggs. Additional histopathological changes observed in the central nervous system (CNS) were: diffuse gliosis, multifocal perivascular cuffs, perivascular edema and multifocal presence of cholesterol crystals. Other pathological findings suggested an alive stranding episode. In cetaceans, different species of the genus Nasitrema have been described in the pterygoid sacs, but occasionally they can migrate through the vestibulocochlear nerve to the encephalon, causing encephalitis. In the Canary Islands, trematodes have been described in the CNS of seven species of odontocetes. Molecular studies (qPCR) detected Nasitrema spp. in frozen SNC samples, finding a higher homology with N. delphini (99%). To the best of our knowledge, the present case represents the first description of a cerebral trematodiasis by Nasitrema sp. in a member of the Ziphiidae family.

HM19 Gross and histopathological characterization of cardiac lesions associated with stress by active stranding in a bryde's whale *(Balaenoptera edeni)*

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Active stranding in cetaceans constitutes an anomalous and extreme situation for such organisms that are not adapted anatomically neither physiologically to the environmental conditions different from those of the aquatic environment. It is a pathological entity "per se" in which acute stress is the central axis of its etiopathogenesis. It presents clinical-lesional findings that can cause the death of the animal or seriously aggravate a previous disease situation, being able to influence the subsequent rehabilitation and recovery of the affected animals. These findings coexist and are comparable to lesions of the "Capture Myopathy Syndrome" (CM), as it has been previously described in terrestrial mammals and wild birds. In cetaceans, the CM has been previously reported in different species, although the descriptions in the Mysticeti suborder are still very scarce. In this work, we describe, by gross, histological, histochemical and immunohistochemical studies, the cardiac lesions related to the extreme response to stress of active stranding in an Bryde's whale (Balaenoptera edeni). The specimen, a neonate male, with a total length of 393 cm and a poor body condition, stranded alive on the coast of Fuerteventura (Canary Islands, Spain) in 2016. It presented an optimal conservation code at the time of the necropsy. Endocardial and epicardial haemorrhages were the cardiac lesions observed macroscopically. Furthermore, with observation under the optical microscope, it was possible to detect other acute or subacute degenerative-necrotic changes consisting of contraction band necrosis, loss of transverse striations, perinuclear vacuolization, interstitial edema, cytoplasmic hypereosinophilia, vascular congestion and infiltration of inflammatory cells. Moreover, skeletal muscle and kidney were studied in examination of possible lesions characteristic of CM. Immunohistochemically, different markers were studied, such as myoglobin, fibrinogen and troponin, which suggested a hypoxic and/or oxidative, acute, antemortem muscular damage.

HM20 Histological and immunohistochemical findings in cetaceans stranded along Sicily coast (2013-2017)

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Cetaceans are considered environmental sentinels used to gain early warnings about potential negative impacts on animal health. This study investigated the pathological findings and mortality of cetaceans stranded along Sicily coast. 88 cetaceans were necropsied according to protocols by National Reference Center for diagnostic activities on dead stranded cetaceans (C.Re.Di.Ma); 67 of which were striped dolphins (Stenella coeruleoalba), 15 bottlenose dolphins (Tursiops truncatus) and 6 common dolphin (Delphinus delphis). Location of stranding, total weight, body length, sex, body conservation code and main biometric measurements were recorded. Tissue samples were collected from lungs, heart, liver, kidneys, spleen and brain for virology, bacteriology, histopathology and immunohistochemistry, according to the preservation conditions of stranded animals. Histopathology showed chronic inflammation in several organs, with chronic pneumonia, chronic hepatitis, chronic interstitial nephritis and non-purulent encephalitis. Immunohistochemistry identified dolphin morbillivirus (DMV) in 12 cases always correlated to non-purulent encephalitis with gliosis, neuronal degenerative changes lymphocytic perivascular cuffing, glial nodules and multinucleate syncytial cells. Toxoplasma was observed in a brain with no signs of encephalitis. The skin, subcutaneous panniculus and muscle were often affected by parasitic diseases. Pathological lesions in alimentary tracts were also observed, consisted of yellowish nodules 3 to 4 cm in diameter, containing parasite debris. Histologically, there were granulomatous lesions involving the submucosa and containing parasite eggs, eosinophilic parasite debris, surrounded by an inflammatory

infiltrate of neutrophils, macrophages, multinucleate giant cells, eosinophils, lymphocytes and plasma cells. Causes of death were determined in 37 of the 88 animals and some (17) were ascribed to anthropogenic activities, others were attributed to encephalitis (12),pneumonia (5) and emaciation (3). These results suggest, that anthropogenic activities are a leading cause of cetacean strandings, while dolphin morbillivirus is the main agent in cases of non suppurative meningoencephalitis in striped dolphins responsible of unusual mortality events in the Mediterranean area.

HM21 Morbillivirus in Risso's dolphins (Grampus griseus): a phylogenetic and pathological study in the Canary Islands

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The earliest evidence of morbillivirus infection (MI) dates to 1982. Since then, cetacean morbilliviruses have been detected in at least 26 different cetacean species, both mysticetes and odontocetes, causing a wide range of lesions and different mortality rates. In the Canary Islands, these viruses (DMV and PWMV strains) have been detected in different cetacean species, including short-finned pilot whales and bottlenose dolphins. Risso's dolphins have been reported year-round in the Canary waters and are considered a resident species. No information is currently available on MI prevalence in this species in this ocean region. Our results show a 16.6% MI prevalence in Risso's dolphins in the Canary Islands (n=12) over a 12-year period. Phylogenetic analysis shows that the strains from the two positive specimens are phylogenetically quite distant, suggesting that more than one strain infects the Risso's dolphin population in this region, and the strain detected in specimen 2 has been circulating mainly in the northeastern Atlantic Ocean from 2007 to 2013.

HM22 Asphyxiation-related death in cetaceans stranded along the Adriatic coast of Italy

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Coastal cetacean species are particularly vulnerable to the effects of human activity, as sentinel species to detect early warning signs of negative trends and impacts in our seas for human health as well as for cetacean conservation. Within the National Cetacean Stranding and Health Surveillance Network, Abruzzo and Molise with a biregional coordination, along with Guardia Costiera, Local Health Units, Centro Studi Cetacei, Istituto Zooprofilattico Sperimentale dell'Abruzzo e Molise "G. Caporale" and the Veterinary Medical Faculty of the University of Teramo, attend at searching causes of death with a project of biomonitoring on this part of the Adriatic coast, thereby covering 100% of the call emergencies throughout 2017. In the last two years 31 cetaceans were found stranded along the Abruzzo and Molise coasts. Twenty-one bottlenose dolphins (Tursiops truncatus) and 3 striped dolphins (Stenella coerulealba), were submitted to necropsy by means of a specific protocol depending on the conservation status. The cause of death was determined in 21 cases (88%). The causes were categorized as natural or anthropogenic. The anthropogenic causes represented 57.1% of the total. In this category there were some cases with typical lesions consistent with by-catch including amputation of the fins or flippers, circumscribed skin abrasions, multiple and parallel evenly incisions onto skin made by the fishermen, or subcutaneous and intramuscular haemorrhages. Another important finding was represented by "watery" lungs as a result of drowning due to accidental capture in fishing nets. Among antropogenic causes there were fatal cases of asphyxiation in bottlenose dolphins resulting from fishing lines wrapped around the larynx ("goosebeak"). This accounted for 33.3% of the total causes of death. Whether the problem is intensive fishing or ghost nets and therefore marine pollution, it is important to have these data to start adopting ad hoc mitigation measures.

HM23 Establishment of the first Dolphin Rescue Center in Russia as a platform for strategic partnership and interaction of scientists, ecologists, animal advocates and government entities

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There is a belief among some marine mammal biology specialists that cetaceans who have lived in captivity would not be able to adapt to their natural habitat. Analyzing the experience of international centers and rehabilitation projects it turned out that a number of such organizations have been successfully rehabilitating and returning bottlenose dolphins to the wild for several years. Since 2013 successful rehab and release of Indo-Pacific bottlenose dolphins takes place in South Korea. It was made possible on the initiative of dolphin protection organization Hot Pink Dolphins and collaboration of Korean scientists, ecologists and government agencies. 7 former captive dolphins have been released back into the wild after 2 month of rehabilitation, including 2 with damaged rostrums and 2 that spent 20 years in captivity. While working on the plan for the first Dolphin Rescue Center in Russia we relied on the experience of those organizations that are engaged in the release of animals in particular rather than keeping them in captivity for breeding, scientific or commercial purposes.
The main purpose of our Dolphin Rescue Center is rehabilitation of cetaceans in the Black Sea, including endangered species confiscated from captivity and wild animals in need of help with the mandatory reintroduction of all rehabilitated individuals back into the wild.
The main goals of the Center are: release of the animals after rehabilitation, establishment of mobile rescue teams to assist stranded animals, research on the behavior and acoustics of marine mammals and the ecological state of the Black Sea and coastal areas, public education about cetaceans and threats that they face. One distinguishing feature of the Center is that it is founded by scientists, ecologists, and animal advocates, thereby will achieve optimal and effective control over the activities of the organization and the means to achieve its main goals.

HM25 The comparative characteristic of a microbiota of an organism of the free living and captured marine mammals

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One of the ways to determine health status of the animals is the analysis of microbiota of the upper respiratory tract, oral cavity, rectum, skin, conjunctiva of the eye and external genitals. We set several goals in our study: to determine total number of microbes, quantitative ratio and composition of mesophyllic aerobic and facultative anaerobic microorganisms of the upper respiratory tract in wild and captive cetaceans (for example Black Sea Bottlenose dolphin) and pinnipeds (for example walrus); to indicate microorganisms with the presence of various pathogenic factors and determine their role in the possible emersion of infectious pathologies; to determine the source of these microorganisms by examining their antibiotic resistance. The studies were conducted between 1999 and 2017 on the base of laboratory of microbiology of K.I. Skryabin MSFVM&B by cultural methods using standard techniques. A blow and smears from the upper respiratory tract of 55 bottlenose dolphins and 12 walruses was collected as a material for the study. Our results showed significant difference in the microbiota of wild and captive mammals. Wild dolphins have 3 or less species of microorganisms, captive - from 5 to 22 species of bacteria and fungus (depending on the adaptation). Wild walruses have from 2 to 5 species of microorganisms; captive - 4-6. The number of microorganisms with pathogenic factors in captive dolphins and walruses was significantly higher than that of the wild animals. When studying the species composition of microorganisms, it was found that non-pathogenic cocci prevailed among wild walruses, and haemolytic, virulent P.aeruginosa in captives; haemolytic cocci prevailed among captive dolphins, while gram-positive bacteria was found among wild dolphins.

HM26 Low prevalence of Cryptosporidium sp. and Giardia sp. in marine mammals present in German waters

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Marine mammal populations around the globe are known to harbour Cryptosporidium spp., and Giardia spp. Most

commonly, detected genotypes / assemblages in these species are the ones typically associated with humans. In the North and Baltic Seas, including German waters, prevalence's information is scarce. In this study, the prevalence of genera Cryptosporidium and Giardia was examined using microscopic examination (based on a modified Ziehl-Neelsen technique - MZN) in faecal samples (n=96) from dead and live individuals from the most common marine mammal species present in German waters – harbour porpoise (Phocoena phocoena), harbour seal (Phoca vitulina) and grey seal (Halichoerus grypus). Additionally, intestinal tissue samples (n=1049) from specimens of 10 marine mammal species were submitted to histopathological examination (HP) for parasite prevalence and characterization of protozoan related-lesions. A low prevalence of the parasites was detected (2.1% and 0.4%, for MZN and HP), only associated with Cryptosporidium sp. Estimated true prevalence, adjusted according to the diagnostic methods sensitivity, was 2.8% and 0.8% for MZN and HP. Giardia sp. was not observed. The presence of enteritis and the lymphoid depletion of Peyer's patches were the most common lesions found in infected animals. A high intensity of infection was evident in the animals with parasites. No significant association was observed between species, sex or age category and parasite prevalence assessed both by MZN and HP. Current results suggest enteric protozoans do not pose a potential threat to marine mammal populations present in German waters. Additionally, the role of these species as reservoirs of the parasites is unlikely, since they don't display an important role in the maintenance of a sylvatic cycle in the North and Baltic Seas. Further research, including parasite molecular typing, is needed in order to establish possible origin routes and to determine epidemiological factors associated with the low prevalence observed.

HM27 Gram-negative microbiota isolated from walruses as an indicator of anthropogenic pollution of the Arctic

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To evaluate microbial contamination in sanitary microbiology the following indexes are usually used: total microbial number, number of sanitary indicative bacteria (like Escherichia coli). But for measuring anthropogenic pressure these indexes are not enough as they consider fecal contamination without taking into account microbiota of animals living on a territory, while they are also affected. That is why we study antibiotic resistance of microbiota isolated from wild animals. The intensive use of antibiotics leads to a fast development of antibiotic resistance in microbiota that circulates in human and animal organisms. Founding antibiotic-resistant gram-negative microbiota in samples taken from wild animals especially those living on restricted areas let us suppose an anthropogenic origin of these microbiota. Moreover such microbiota can be a danger for animal's health because while being parts of normal microbiota, members of bacteria genuses like Escherichia, Pasteurella, Salmonella, Pseudomonas and others can also cause serious diseases. The aim of this study was to isolate, identify gram-negative bacteria from the samples of walruses microbiota, evaluate their antibiotic resistance and define the possible origin of microbiota. The objects of our study were the samples taken from 7 walruses of the Atlantic subspecies (Red book of Russia). The samples were collected in 2017 by the team of Marine mammal council while their expedition to Vaygach island (north of Russia, a nature reserve). The samples included smears from conjunctiva, anus, nasal, oral cavities, external genitalia, the wound. The result of the study was isolation of gram-negative microbiota in 78% of the samples. The highest number and variability was found in samples from anus and oral cavity. Bacteria were identified to genuses: Escherichia, Yersinia, Pseudomonas and others. Some isolates were pathogenic. Also antibiotic-resistant microbiota were found. These results can indicate the ways of pathogenic bacteria circulation in the ocean.

HM28 Possible role of coccus microbiota in pathologies of Atlantic Walrus (Odobenus rosmarus)

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Gram-positive coccus are the part of normal microbiota of many marine mammal species. Some species of these microorganisms it is known that being able to cause different pathologies. For the development of such diseases a row of factors have to influence on decreasing level of immune reactivity. Microbiological structure of ocean waters can change every year and it can have influence on animals. Annual monitoring is important for the research of both these animals population and as an indicator of the level of the environmental pollution. The aim of our research was to conduct a microbiological studies of biomaterial of walrus for detecting coccal microbiota and to prove its possible

role in pathologies of these animals. The material for a research has been collected in 2017 by forces of collaborators of Marine Mammals Council of Russia. Material for research were examples of smears from mucous membranes of oral, nasal cavities, conjunctiva and anus, from wounds and external genitals of 7 animals. Our researches were done with cultural methods with obligatory studying of factors of pathogenicity. Serologic indication of streptococcus was also applied with to use commercial test-systems. As the result of the researches coccus were indicated in 19 samples. The largest number of alive cells of coccus were presented in the materials from nasal cavities and conjunctiva, the least – from anus and external genitals. Selected coccus were identified to the species Staphylococcus, Streptococcus, Enterococcus. During studying pathology factors it was found that 33% of the selected coccus had haemolytic properties. Coagulase-positive coccus were not found. While studying health status of Atlantic Walrus with microbiological methods we found out that in the case of detecting coccus microbiota, it's necessary to detect its pathology factors. It's also necessary to determine total and relative quantity in a sample.

HM29 An in silico study of dolphin Morbillivirus haemagglutinin complexed to sperm whale *(Physeter macrocephalus)* SLAM and nectin-4 receptors

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Dolphin Morbillivirus (DMV), a highly pathogenic Cetacean Morbillivirus (CeMV) strain, has recently expanded its host range in the Western Mediterranean, thereby involving also sperm whales (Physeter macrocephalus). Haemagglutinin (H), a promising antiviral target, allows DMV attachment to immune and polarized epithelial cells by signaling lymphocyte activation molecule (SLAM) and nectin-4, respectively. We report homology-modeled DMV H complexed to sperm whale SLAM and nectin-4 putative receptors, using this scaffold to predict B-cell epitopes for potential diagnostic and vaccine developments. Aminoacid sequences of DMV H, sperm whale SLAM and nectin-4 were downloaded from GenBank and subjected to an ad hoc BLASTP search. Template candidates were selected by knowledge-based criteria, thereafter undergoing alignment and correction by visual inspection. Structural comparisons were also made by superimposing 3D-models against the solved structures of Measles Virus H bound to human SLAM and nectin-4. Obtained 3D-models were then subjected to refinement and molecular dynamics, with SLAM and nectin-4 automated docking onto DMV H surface being additionally performed for appropriate positioning, orientation and binding. DMV H antigenicity was evaluated by linear and conformational B-cell epitope predictors, with data being iteratively filtered according to consensus degree and solvent accessibility. Best candidates were ranked by evolutionary conservancy and mapped on the DMV H 3D model. High quality models of DMV H bound to sperm whale SLAM and nectin-4 were built, with 5 linear and 2 conformational B-cell epitopes being found outside the H-SLAM/nectin-4 interface; these were evolutionarily conserved among CeMV strains and showed <40% sequence homology within the Morbillivirus genus. Molecular dynamics revealed the potential contribution of given residues in viral-host interaction. The present workflow relies on multiple predictions, consensus filtering and visual mapping on a confident homology-modeled 3D structure, thereby achieving a reliable and cost-effective identification of B-cell epitopes as potential candidates for DMV immunodiagnosis and active immunization purposes.

HM30 Baleen plates of mysticetes adsorb strontium during their growth

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Strontium is a metal widely present in oceanic waters, in which it distributes along gradients mainly dependent on oceanographic and biological factors. Despite not being an essential element, it commonly accumulates in the bone of vertebrates, where it can substitute calcium, and in the fur of mammals. In this study, we investigate concentrations of Sr in the growth layers of baleen plates of fin whales, marine mammals that perform long latitudinal migrations across water masses markedly different in their chemo-physical characteristics. Baleen plates are composed of keratin tissues that, similarly to the hair and nails of most mammals, grow continuously and preserve a permanent record of the chemical characteristics of the environments visited by the individual. Sr concentrations were determined in samples

taken at regular intervals along the growth axis of baleen plates of 10 fin whales proceeding from two geographically distinct areas: NW Spain and SW Iceland. Concentrations ranged 5-40 mg Kg-1 and showed a marked increase from the proximal to the distal layers of the plates. These increasing concentrations are explained by the progressive Sr adsorption to the surface keratin of the plate with time, a process also known to occur in the hair of mammals. However, the pattern of increase often showed fluctuations along time, likely reflecting the exposure of individuals to changing environments during their annual migration. Irrespective of these trends and fluctuations, Sr concentrations were overall significantly higher in baleen plates of fin whales from NW Spain than in those of whales from SW Iceland. This difference undoubtedly reflects differences in the baseline Sr levels of the two geographical regions and confirms previous indications of isolation between the two populations. Research supported by project CGL2015-70468-R (MINECO/FEDER, UE)

MC MANAGEMENT & CONSERVATION

MC01 From local to regional: acoustic monitoring targeting MSFD's and Cetacean's Good Environmental Sound Status

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EU Countries around the Mediterranean Sea are targeting the Marine Strategy Framework Directive's (MSFD) Good Environmental Status start-up by 2020. This should also improve conditions for cetacean survival. Among the various anthropogenic pressures to monitor and regulate there is marine noise which falls under MSFD's Descriptor 11. Assessing the levels and addressing the impacts of this noise problem is essential to effectively reduce it. Pilot projects in Western, Central and Eastern Mediterranean areas, undertaken as part of the QuietMED project, allow critical investigation of the methods and strategies needed to achieve this MSFD's requirement at regional level. The deployment of autonomous recorders for monthly recordings, using calibrated hydrophones for broadband capturing of noise, provided vital preliminary data measured off the Maltese Islands and the Spanish Cabrera Archipelago. Various investigations were carried out on the acoustic data collected to find the status of marine noise in these study areas, situated at different distances from main shipping paths, while considering presence/absence of cetaceans in the same spatiotemporal situations being analysed. Alongside the standardized 1/3 octave noise indicators, different algorithms for the automated detection of clicks, whistle and transitory low frequency calls of some cetacean species are used. Acoustic monitoring strategies that allow for comparable measurements of noise pollution while also monitoring the presence of elusive and vulnerable cetacean species strengthens the effectiveness and implications of the extent to which the Good Environmental Status for sound would be reached. It also adds valuable knowledge to field visual monitoring. Cetaceans are often considered not only as important flagship and umbrella species but also indicator species. Therefore acoustic studies, from local to regional, allow for the verification of how cetacean species distribute in relation to noise in the marine environment. Integration of the ecosystem and species specific approaches increases the effectiveness of acoustic monitoring.

MC02 Whale-watching in Russia: from idea to implementation. Experience of creating and conducting tourist scientific expeditions for the observation of marine mammals in the Black sea

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Worldwide more and more attention of tourists is attracted to expeditions and short trips to monitor cetaceans in their natural habitat – the open sea. Russia is a country with vast marine areas and many kilometers of coastline, with tourist potential and attractive biological and cultural resources. The Black sea and the species of marine mammals inhabiting it (Tursiops truncatus ponticus, Delphinus delphis, Phocoena phocoena relicta) are in a vulnerable situation due to the deteriorating environmental situation in the region Autonomous of Republic Crimea and Krasnodar Krai. Unreasonable fishing, fishnets set in a sea, illegal capture for dolphinariums, active navigation, and pollution of the sea with garbage, domestic and industrial wastewater cause significant damage to populations of dolphins. With the aim of solving a range of environmental, social, and regional objectives in 2016 there was created Whale-watching-project

"Dolphinology". In 2017 the project carried out 2 expeditions, representing the symbiosis of science and tourism. The first expedition took place from 15 to 23 June 2017 and the second one in the period from 1 to 8 September 2017. The first expedition was conducted along the route from Alushta to Sevastopol. The second expedition followed the route from Yalta to Cape Bol'shoy Utrish. Totally 13 participants took part in two expeditions: 2 supervisors and 11 volunteers from 2 countries: 6 regions of Russia and 2 cities of Israel. Thus, one of the expeditions received the all-Russia (national) status and international status. During the expeditions, volunteers took an active part in collecting biological data using a variety of methods, and also listened to educational lectures on the biology and ecology of the sea. The experience of two expeditions showed high social, scientific, educational, and environmental value of created whale-watching project "Dolphinology", and its high relevance to the different regions of Russia with the sea area.

MC03 First assessment of pinger use with fishing gear in Maltese waters: addressing dolphins-fishermen conflicts

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The Bottlenose dolphin, Tursiops truncatus (Montagu, 1821), is one of the most frequently observed cetacean in the Mediterranean coastal waters. In Maltese waters this species has been subject of dedicated research since 1997. In order to mitigate against dolphin entanglement in the increasing congestion of fishing gear and avert detrimental conflicts with frustrated fishermen, a research project using Banana Pingers was set up since 2015 to assess the efficacy of these instruments in helping dolphins avoid trouble. The Banana Pinger used for this study meets the criteria set by the European Union Council Regulation 812/2004 for pingers. Repeated trials, using thirty Banana Pingers distributed among various coastal artisanal trammel net fishermen, which had been monitored for 3 months prior to the use of pingers to assess the extent of the problems with dolphins and the risks to dolphins when depredating from fishing nets, were undertaken. For every fishing event, data on fishing position, time, species caught, number of dolphins observed during fishing and collection of nets, evidence of depredation or damage of nets was recorded and compared. The results on associations of bottlenose dolphins and trammel fishermen activities have been found to be more than 60 to 80% of trammel fishing found to be undertaken in the presence of bottlenose dolphins. Results also indicate that trammel net damage and catch depredation were both dramatically reduced to 2% and 6% respectively during the first year of use when compared with the original records of damage and depredation and in comparison to the controls involving fishing effort running concurrently without the use of these pingers. A second phase of this research project is assessing the extent to which seasonality, potential habituation by the dolphins and presence of other anthropogenic activities in the area may influence the sustained efficacy of these instruments.

MC04 Social aspects and prerequisites for the development of whalewatching in Russia

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The below research was made in order to create and promote whale watching tourism in Russia. The research took place in 2014 and 2016, and the aim was to understand the social aspects of tourists and their needs as well as the collection of information from the tourists in regards of their occasional meeting with dolphins in the wild. The main data collection tool was via a special survey. In 2014 it was done by internet. Face-to-face interaction with Russian Speaking tourists took place in 2016 in Sevastopol, Crimea. The total number of the survey attendees was 178 in 2014 and 76 in 2016. The survey covered 178 respondents in 2014 and 76 in 2016. The survey had shown that only 36,52% of the respondents were familiar with the term "whale watching".47,36% of the respondents had seen dolphins in the Black see in Crimea in 2016. According to the 2014 survey 35,39% of the respondents would choose dolphinarium as their way to watch the animals, and 20% have visited a dolphinarium 1 or more times. According to the 2016 surve,y 23% of the respondents pointed out that they have seen dolphins in a local dolphinarium, 29% - during a trip, 43% - have seen dolphins in the wild. In 2014 85,96% of the respondents expressed their positive attitude towards whale watching and dolphinwatching tours for tourists. In 2016 54% of the respondents expressed that would rather to see dolphins in the wild than in a dolphinarium.

MC05 Assessing short- and long-term individual exposure rate of two cetacean species to whale-watching activity in Madeira Island (NE Atlantic)

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The whale-watching industry considerably increased worldwide in the last decades, leading the scientific community

to urge for more studies and assessments. Indeed, several studies suggested that the cumulative effect of repeated exposure of cetacean populations to this disturbance can affect their behaviour, reproductive success and even mortality rates. In this study we used photo-identification catalogues of two of the most sighted cetacean species in Madeira Island, the common bottlenose dolphin (Tursiops truncatus, n=367) and the short-finned pilot whale (Globicephala macrorhynchus, n=536), to assess their individual exposure rate to the whale-watching activity. The datasets were based on 13 years of opportunistic photographs collected by whale-watching operators, therefore each capture was considered as an exposure event. Time intervals (expressed as number of days) between recaptures have been calculated for each individual. Then, the number of recaptured individuals on the total (i.e. re-sighting rate) and the number of recaptures per individual, within different time intervals, has been quantified. Re-sighting rate within the same day resulted higher for pilot whales (8%) than for bottlenose dolphins (2%). The tendency inverts for intervals longer than 2 days, with a total re-sighting rate of 33.8% for pilot whales and 45.5% for bottlenose dolphins. On the long-term, 28.1% of the bottlenose dolphins and 29.3% of the pilot whales have been exposed in different years. Overall, individual pilot whales have been exposed for more years than individual bottlenose dolphins (up to 12 versus 6) and they have been recaptured more times (up to 54 versus 18). This study gives a first insight on the individual exposure of bottlenose dolphins and pilot whales to the whale-watching activity in Madeira Island, but the opportunistic nature of the data suggests that these exposure rates are underestimated. A systematic data collection from the operators may be required to delineate an accurate assessment.

MC06 Collaboration between academia, industry and regulators to investigate cetacean collision risk from tidal turbines

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Many countries have set ambitious targets for carbon emission reductions, with offshore energy anticipated to form an important component. Tidal energy has the potential to provide predictable energy to local communities; however, it is important to consider environmental impacts prior to and during installation and operation. There has been significant investment in tidal energy technology in the UK in recent years, with £68.3 million invested directly in wave and tidal energy in Wales in 2017 . However, uncertainty about the potential for marine mammals to collide with tidal turbines is a concern and presents a challenge to the consenting process. Collaborations among stakeholders are often key to effectively assessing potential impacts of industrial developments. The SEACAMS2 project is a University-led research & development (R&D) collaboration between stakeholders in the marine renewables sector in Wales which aims to identify research priorities and fill knowledge gaps using applied interdisciplinary academic study. Here, we describe two R&D collaborations relating to the prediction of collision risk of small cetaceans. Preliminary results and an assessment of the dynamics between stakeholders are reported. The first project uses an ecological approach prior to installation to investigate the fine-scale spatio-temporal distribution of harbour porpoises (Phocoena phocoena) relative to hydrodynamics. An array of seven Sound Traps was deployed to quantify encounter rates during periods of highest risk, during high tidal flow when turbines are rotating. This study also investigates the use of a 3D oceanographic model to investigate fine-scale flow features that influence porpoise behaviour. The second project describes the development of a study to track cetaceans around a full-scale operating power kite that is due to be installed in summer 2018, in which a multi-channel hydrophone array will be used to localise and track vocalising cetaceans to quantify responses to the device and inform risk of collision.

MC07 Marine pollution caused by Floating Marine Macro Litter and comparison with presence, spatial distribution and density of cetaceans, in the Pelagos Sanctuary

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Plastic debris is one of most important source of marine pollution and is a threat for cetaceans species and the marine ecosystem. The "Pelagos Sanctuary" is a marine area established for protecting marine mammals, because this area has high ecological importance even if there is high level of anthropogenic activities. Aim of this study was to evaluate the marine litter pressure in the south-eastern part of the Pelagos Sanctuary. We calculated on a seasonal basis the

composition, the spatial distribution and, where possible, the source of Floating Marine Macro Litter (FMML), and compare this data with the presence, the spatial distribution and the density of cetaceans, to assess potential risky areas taking into account seasonal variability. Ferries were used as platform of observation to repeatedly surveyed high sea trans-border waters. Data were collected along the Livorno-Bastia route from October 2013 to August 2015 following a protocol adapted from the Guidance on Monitoring of Marine Litter of Marine Strategy Framework Directive. A dedicated observer located on the ship deck monitored a fixed strip (between 25 an 100 mt according to the sea state) in which all floating object greater than 20cm were detected under sea conditions 2 Beaufort. Samplings were categorized according to the guidance. In order to facilitate data comparison, the FMML monitoring was conducted synoptically whit the cetacean sampling program. Over 94% of sampled debris were composed by artificial polymer material, of which the most frequent categories were sheets, bags, bottles and polystyrene boxes. Seasonal maps reveals higher density of FMML in spring and summer, in coincidence with highest cetaceans encounter rates, and high density areas close to the Corsican coast. Findings of this study underline that litter is most likely threatening cetaceans in the study area and highlight priorities both for marine conservation and waste prevention actions.

MC08 Operation Milagro: Last chance for the Vaquita

Elena Santolini, Tommaso De Lorenzi.

Milagro campaign is the last effort to create a miracle and save the Vaquita. Since 2015, Sea Shepherd Conservation Society has been working in the Upper Gulf of California (Mexico), to protect the near extinct Vaquita porpoise (Phocoena sinus), one of the most endangered marine mammals in the world, with probably less than 30 specimens left. Despite a designated refuge created in 2005 specifically to protect this little porpoise, illegal poachers (often working in conjunction with drug traffickers) are using illegal gillnets to catch the Totoaba (Totoaba macdonaldi). This fish is prized for its swim bladder, which is sold on the black market in China for hundreds of thousands of dollars. The vaquita is the victim of by-catch in the illegal gillnets for the Totoaba. The Milagro IV campaign is currently ongoing with 3 US Coastguard Cutter Class: M/V Farley Mowat, M/V John Paul Dejoria, and M/V Sharpie in collaboration with the Mexican government, some local fishermen involved in the Ghostnet project for retrieving ghost nets, the Museo de Ballena, and scientists from different institutions. All the retrieved nets are subsequently dismantled, and prepared for disposal. The operation consists of removing gillnets, patrolling for poachers, documenting and collecting data to share with the scientific community, and reporting all suspicious activity to the Navy. Since 2015, 518 pieces of illegal fishing gear has been removed. During Campaign Milagro III (2016-2017), 233 pieces of illegal fishing gear was removed, 5 dead vaquita were found, 1198 entangled dead animals were found including: sharks, dolphins, rays, whales, turtles, sea lions, and 2140 live specimens released. These numbers suggest that to preserve the Vaquita it's also imperative to increase the effort of illegal gillnet removal in the habitat of the Vaquita. We need to reinforce the collaboration with the institutions and the stakeholders to stop the illegal Totoaba swim bladder traffic.

MC09 A combined social-ecological approach for the assessment of the Samadai Reef management plan

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In 2003, a management plan to regulate dolphin watching and swim-with operations at Samadai Reef (Marsa Alam, Egypt) was implemented with the support of numerous stakeholders. The Egyptian Red Sea had been swept by mass tourism over the previous decade and dolphin-based tourism was booming in this reef, a resting area for spinner dolphins. This generated widespread concerns over the sustainability of the industry and led to the establishment of a site-specific plan. The plan has been enforced since, yet this is among the first attempts to fully assess it. We employed Duffus and Dearden's conceptual framework for wildlife-oriented tourism, which comprises an ecological, a social, and an historical component. Information on dolphin population ecology and behaviour, on the history of practices and on the current attitudes towards dolphin-based tourism were collated to gauge the current state of the destination and identify the plan's strengths and weaknesses. Samadai dolphins' responses to interactions vary during the day and the plan seems to successfully safeguards local dolphins' resting needs. The high site fidelity and the limited connectivity to other resting sites, however, suggest a potential risk of chronic exposure that should be further investigated. As predicted by the framework, the site experienced an exponential tourist growth after discovery and, as reported by key stakeholders, a shift from expert to novice visitors. In spite of Samadai still being a popular destination, its importance and significance do not appear to be fully understood by the users. Although aspects of dolphin ecology, governance and tourist satisfaction still need to be fully resolved, the application of this framework to the Samadai case allowed

a first, comprehensive assessment of the plan. While its efficacy in protecting the resident dolphins is confirmed, innovative interventions to address discontent and conflicts in the community of users are required.

MC10 Towards the first sustainable whale watching enterprise in Malta: the challenge of merging public awareness with research

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Maltese waters are located in the Sicily channel above the Tunisian plateau, an area that represents an ecological and socioeconomic region of unique importance in the Mediterranean Sea. These waters harbour essential habitats for the survival of endangered species (i.e. long beaked common dolphin). Despite the presence of critical habitats, very little scientific knowledge is available about cetacean habitat use both spatially and temporally. To this end, whale/dolphin-watching activities can provide essential data to comprehend better species presence and distribution, also temporally. During summer 2017, the first whale watching excursion was carried out around the Maltese Islands by Eco Marine Tour. Eco Marine Tour is a new Maltese company whose aims are on one hand to conduct sustainable tourism in an area where the marine excursion market is constantly growing and on the other to collect scientific data on specific indicators (as requested by MSDF) to share with universities and research institutions at both local and international level. In this framework, visual and acoustic surveys were conducted in August mainly around the north-western area of the Maltese Islands at a maximum distance of 12 nautical miles from the coast, covering a bathymetry range between 100 and 1000 meters and an area of approximately 200 Km2. During two trial surveys, the species observed was the common bottlenose dolphin (Tursiops truncatus) (100% of the total sightings). Data on other marine wildlife sightings was also collected: marine turtles (Caretta caretta) and seabirds (i.e. Storm petrels, Hydrobates pelagicus; Scopoli's shearwaters Calonectris diomedea and greater flamingos Phoenicopterus roseus). This very preliminary qualitative data further confirms the great ecological value of the area. Future whale watching surveys and collaborations with NGOs and research/academic institutions can increase knowledge on marine mammals in Maltese waters, vital for the implementation of appropriate management strategies for marine conservation.

MC11 Space and perspectives: are the Ringed seals in the Gulf of Finland approaching the vanishing point?

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Ringed seals in the Baltic Sea became separated from the Arctic Ocean population by post-glacial rebound about 10 000 years ago. Up to the beginning of the 20th century species was abundant (estimated 250 000) in the northern and central parts of the sea, the distribution was continuous throughout the range, after what population collapsed mainly by overhunting and pollution. Regardless of strict protection in Gulf of Finland the seal numbers have continued to fall – from about 3000 in 1980 to less than 200 today. We have used telemetry in 1999 (n=4), 2014 (n=5) and 2017 (n=7) to learn that the seals stay in the eastern part of gulf and the individual kernel home range in autumn were 198, 438 and 254 km2 with total used area 1334, 1302 and 784 km2 respectively. This is very small in comparison to e.g. Gulf of Bothnia where average individual uses 8030 km2. However, our data comes from autumn when seals forage close to haulouts, their summer ranges are not registered. The reasons for collapse of a strictly protected population are unknown, but several key factors can be outlined and accounted for. This area is currently under growing environmental and human pressure: no ice forms in this part of the bay and about 50 ships per day are cutting through breeding and foraging areas. Concentrations of marine pollutants and cyanobacteria are elevated in the area, gene pool is minuscule and grey seals are moving in. Survival of this population requires dedicated efforts of both conservation and business managers.

MC12 Marine renewable energy as a positive force in marine mammal conservation: Strategic partnerships provide impetus for improved marine mammal science and conservation

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The first SEACAMS project, short for "Sustainable expansion of the Applied Coastal and Marine Sector" and funded by the European Regional Development Fund (ERDF), was set up to boost the marine industry sector in Wales, and supported a wide variety of marine industries in Wales. The following SEACAMS2 project focuses on the nascent marine renewable energy industry and its supporting supply chain in Wales. Through close links with both the MRE sector

and the marine licencing bodies it was quickly identified that one the main obstacles the industry face was the lack of information on both the potential impacts from such development to marine mammals, but also the low level of baseline data available for marine mammal distribution, abundance and habitat use at key tidal and wave energy sites in Wales. In this presentation we provide case studies and research results from various joint industry and academia research collaborations which have increased or will increase scientific understanding of how marine mammals use high tidal energy environments. In addition, we demonstrate with concrete examples how studies initiated by the MRE industry have provided motivation for closer collaboration between local stakeholders, conservation groups, academia and the regulators, leading to augmented awareness of gaps in long-term monitoring of protected species, which in turn has led to added research and conservation efforts locally. We showcase studies at tidal energy sites which have increased capacity building in grassroots organisations as well those which have enabled academic institutions to use novel methods and techniques for surveying marine mammals. We also provide evidence how government nature conservation bodies can gain from liaising with academia and the MRE industry to achieve their conservation and monitoring objectives.

MC13 MARCET Project: International and Multidisciplinary Network for the conservation of cetaceans and the promotion of a sustainable tourism associated with whale watching activity in the Macaronesian waters

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The Macaronesian region is an important biodiversity hotspot located in the North Atlantic Ocean, between Europe and Africa, conformed by four archipelagos (Azores, Madeira, Canary Islands and Cabo Verde Islands). Among the species that inhabits this area, cetaceans occupy a remarkable place in terms of abundance and diversity, having confirmed the presence of 32 different species residing or transiting their waters. MARCET project (Interreg MAC 2014-2020) was conceived with the objective of create and consolidate a multidisciplinary and interregional network for the conservation of Macaronesian cetaceans and to achieve a good environmental status of the marine areas where they reside. This network comprises 20 partners from Canary Islands (Spain), Azores and Madeira (Portugal), Cabo Verde Islands and Senegal, and brings together specialists in monitoring and health surveillance of cetaceans and operational oceanography with the purpose of integrating, harmonizing and optimizing knowledge, infrastructures and good practices in the region. In addition, the MARCET network aims to transfer and disseminate state-of-the-art science and technology to promote the growth and sustainable development of tourism associated with whale watching activity, through the creation, demonstration and generation of new eco-innovative products and services, as well as sustainable business models. MARCET is structured in three specific objectives: The first two are fundamental to the establishment of ecological and environmental sustainability criteria, integrating knowledge transfer activities and procedures in monitoring and health surveillance of cetaceans (O.1), as well as advanced techniques in operational oceanography

(O.2). The third (O.3) studies the socio-economic impact of the whale watching activity and the transfer of new eco-innovative products and business models. Transversally, a detailed program of knowledge transfer and training is being performing, and a powerful ICT tool is being creating, a Collaborative Virtual Community (CVC), to harmonize and share data, information and methods to overcome territorial fragmentation.

MC14 Cetacean Conservation: Science and policy working in partnership

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Cetaceans are one of the most legally protected groups of animals in Europe yet our understanding of them and their conservation requirements is still poor. Cetaceans are protected through species legislation, site protection (eg MPAs) and indirectly through wider seas measures. However, there is a need to adopt a broader approach in conservation planning to enable dispersed threats and pressures to be identified and mitigated. The need for a UK harbour porpoise conservation strategy was identified following the consultation for harbour porpoise SACs with many stakeholders highlighting that other small cetaceans could also benefit from a strategy. A partnership was formed between the country SNCBs, Defra and the devolved administrations to further develop this. The aim is to create an integrated approach to protecting cetacean species within the current legal framework that takes account of the contribution of wider policies and marine spatial management. It is intended to support decision making and identify actions necessary to maintain or improve the conservation status of dolphins and porpoises in UK waters. It highlights where evidence is lacking or where confidence in understanding may be poor. Filling evidence gaps will often require monitoring and/or research. The strategy is not designed to duplicate existing actions but identifies measures already in place and where further measures are needed. It is intended that it will provide an overarching strategy to ensure a holistic approach to conservation, demonstrating how site based & wider measures complement each other in order to deliver conservation. Developing effective conservation measures within the strategy requires more than 'good science' and evidence. It needs all stakeholders to contribute, take ownership and ultimately progress actions to ensure good conservation status for small cetaceans in UK waters. This paper/poster outlines the process taken and identifies the further actions required.

MC16 Investigating potential causes of population change in a coastal bottlenose dolphin community

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The two major pieces of European conservation legislation, the Habitats Directive and Marine Strategy Framework Directive, require some assessment of the population status of particular indicator species. For cetaceans, this can present a major challenge. One such species that has been selected is the bottlenose dolphin, whose coastal populations are often exposed to a range of anthropogenic pressures. Here, we use data from line-transect surveys with Distance sampling and Capture-Mark-Recapture analysis of Photo-ID information in a long-term study of bottlenose dolphins within and beyond Special Areas of Conservation (SACs), to investigate population trends, testing the power to detect whether any observed changes are both statistically significant and reliable (accounting for uncertainty). Whereas over the 17-year study period, the overall population size has not changed significantly, over the last ten years there has been a significant decline in dolphin numbers occupying the SACs. Photo-ID over a wide region reveals that, typically, a portion of the population seasonally migrates more than 100km beyond the large bay that is the centre of their summer range. However, in recent years, a higher proportion have been remaining year-round outside this area, suggesting that the bay is no longer so favourable for the species. Two human activities that potentially could impact upon the dolphin population include scallop fishing causing habitat change and recreational activities causing disturbance. The spatio-temporal patterns of these activities were related to those of this dynamic dolphin population, supplemented by habitat modelling and consideration of both foraging ecology and life history parameters such as birth rates and juvenile mortality. The results of those analyses indicate that neither activity can be ruled out as factors affecting the population. New management measures are proposed to mitigate potential negative effects.

MC17 Mapping current and future risks to the globally significant marine habitat of Chilean Patagonia

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This study presents a preliminary mapping of habitat and species risk in the Chiloense Ecoregion (ChE) in southern Chile. The ChE is a coastal area in northern Patagonia (41°S- 47°S) and is one of the most significant and extensive fjord regions in the world. It is also a significant area for conservation of marine mammals in Chile, and holds particular importance for the threatened Blue whale (Balaenoptera musculus) in the Southeast Pacific, as it is a critical feeding ground. Despite its importance, the lacks of environmental regulations and enforcement have left the ChE under pressure from many anthropogenic activities, especially overfishing and aquaculture. This project aims to identify the areas of greatest risk within the ChE, using the InVEST Habitat Risk Assessment (HRA) model (http://www.naturalcapitalproject.org/invest/). By combining data on human stressors (e.g. aquaculture, nutrient runoff), and biodiversity features (e.g. Blue Whales and cold water corals), we spatially assess the impacts of human activities on marine habitat, and livelihoods of local communities. The HRA Model combines distribution data of the exposure of the conservation features to anthropogenic stressors, quantifying the temporal and spatial intensity of each stressor. The model then measures the consequences of exposure to stressors by measuring the effects of the stressors on the area, structure and recovery ability of each conservation feature. This analysis will allow for identification of areas where the conflict between conservation values and anthropogenic activities is likely, and thus allow for crucial spatial prioritisation of management activities, such as marine protected areas or aquaculture restrictions. This research presents a crucial first step to the development of a comprehensive conservation strategy for the Chiloense Ecoregion, which is vital to safeguard this unique area into the future.

MC18 Cetacean acoustic diversity in the south atlantic ocean: complimentarity of techniques applied for marine conservation

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The South Atlantic Ocean remains one of the less studied regions on the globe and it is reflected in the knowledge of important marine megafauna such as cetaceans. Aiming to contribute with this gap, we are constituting a long term database through a mitigation project required by the Brazilian environmental agency for the oil and gas industry in the Santos Basin, southeast Brazil, employing diverse methods such as Passive Acoustic Monitoring (PAM) and telemetry. The present work reports on the findings about cetacean acoustic diversity obtained during field surveys conducted between November 2015 and November 2017. We obtained 412 detections (only 9 of them for Mysticeti), confirming visually the identification of 15 cetacean taxa (Stenella attenuata, S. longirostris, S. clymene, S. frontalis, Tursiops truncatus, Steno bredanensis, Grampus griseus, Physeter macrocephalus, Sotalia guianensis, Globicephala sp., Delphinus sp., Physeter macrocephalus, Pontoporia blainvillei, Kogidae, Ziphidae and Megaptera novaeangliae). Three additional species (Balaenoptera borealis, Eubalaena australis and Orcinus orca) were recorded with DTAGS, representing an important input of large whales in the PAM collection. Gathering all the cetacean recordings in a Sound Library will allow researchers to better understand the acoustic diversity and ecology related to the cetacean sightings on the Brazilian Shelf. We also discussed about how different techniques can work complimentarily to maximize sound collection in oceanic monitoring research and how these results could benefit marine conservation.

MC19 Marine activities causing harassment to common, striped, bottlenose dolphins in the waters between Gibraltar and Algeciras

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The waters between Gibraltar and Algeciras, south of Spain, are considered as a pollution hotspot. Every year 100.000 ships use the bay for bunkering /port operations or cross it towards to the Strait of Gibraltar. Together with high-density of recreational/commercial activities, it has become a threat to bottlenose (Tursiops truncatus), striped (Stenella coeruleoalba), but mainly for the endangered Mediterranean subpopulation of common dolphins (Delphinus delphis), which use these waters as breeding and feeding ground. This preliminary study focuses on the presence of harassment

events caused by recreational activities from June 2017 until September 2017. It was conducted aboard a responsible whale-watching platform. During the cetacean encounter (CE) data about the animals detected were gathered, as well as, from another vessel's performance and evaluated accordingly to the Spanish and Gibraltar cetacean protection laws, with focus on the exclusion zone (<60 m), where the vessels entry is prohibited. From a total of 655 CE recorded, 74.65% of the vessels (commercial/recreational whale-watching and sport fishing targeting tuna among others), entered the exclusion zone where in some cases cetaceans were chased actively or being approach in a dangerous manner. The speed of approach was higher than 4 knots on 44,89% of the CE. Irresponsible CE can cause modification in cetacean's group size and cohesion, changes in surfacing and diving patterns, declines in feeding and resting times, shifts in migration patterns, stress, etc. This can have an adverse effect on the health of the animals and can lead to chronic stress can cause avoidance of a habitat. Growing desire to interact with cetaceans, as well as increasing amount of recreational activities, brings responsibility to make sure that this new source of exploitation doesn't damage cetacean populations. Therefore, it is crucial to implement better conservation measures in these waters.

MC20 Observing Cetaceans From Land – Developing Co-operation as the Driving Force Behind Sustainable Whale Watching Tourism

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The Canary Islands are known for an extraordinarily high cetacean species diversity and whale watching tourism has developed rapidly since the 1990s. Off La Gomera, where 23 cetacean species have been documented, few operators offer whale watching trips to date. Through a long-term collaboration with one operator, the NGO MEER has been realizing a best practice approach to whale watching, where scientific data collection and public education for locals and tourists are integrated in various ways. In 2017, the first permanent platform for the observation of cetaceans from land was established. It is designed and equipped for scientific research (i.e. documentation of sightings, BDA studies, monitoring of ferry traffic, etc.), but also serves as an aid for whale watching operators when cetacean sightings from land are communicated to the observation vessels. From April through October 2017, on 40 observations days (96 h 45 min of sighting effort), 69 cetacean sightings were documented, comprising six species. Various behavioural states and responses to vessels were observed. Regularly, sightings were conveyed from land to whale watching vessels at sea. As the service to convey sightings made from land brought forward through an NGO is available for all current operators, the platform fulfills a variety of valuable tasks, apart from research: It a) acts as a mediator between operators competing for the same resource; b) helps increasing the sighting success of vessels; and c) helps creating a sense of community within operators. In the future, the platform also shall help reducing potential disturbances by dispersing boats within the area covered by operators. Thus, the new platform represents an essential part of a long-term conservation strategy to further develop whale watching as a sustainable use of cetaceans off La Gomera. It is hoped that similar platforms will be established on other Canary Islands and elsewhere.

MC21 Co-occurrence of Bottlenose dolphin and human activities along the Mediterranean French continental coasts

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The Mediterranean French continental coasts are places of many and increasing human activities (e.g., fisheries, recreational activities, renewable energies, tourism). These coasts are also regularly frequented by Bottlenose dolphins (Tursiops truncatus), therefore leading to interactions between dolphins and anthropogenic activities. These interactions, including depredation, bycatch, parasitism or harassment, might negatively affect the co-existence of dolphins and human activities. Despite their implications, our knowledge about these interactions remains scarce in France. In this study, we determined the areas of co-occurrence (where interactions could occur) between dolphins and human activities, focusing on pleasure vessels and fishing boats. Using a GIS approach, we characterized and quantified the nature and the spatio-temporal distribution of these interactions. Our study area covered the continental shelf of the Gulf of Lion and Liguro-Provençal area. We used data collected on dolphins, pleasure vessels and fishing activities between 2011 and 2015 during several boat and aerial campaigns at sea: GDEGeM (GIS3M), IMPACT-CET (EcoOcéan Institut and its partners) and SAMM (PELAGIS Observatory, UMS 3462 URL / CNRS, AAMP, CEBC, SAMM). Bottlenose dolphins were observed all year round, with important concentrations in the Gulf of Lion and in Provence around the Hyères archipelago. We found that the overlapping between the extent of human activities and the presence area of bottlenose dolphins was high. Specifically, the overlap with pleasure vessels was 92% in the Liguro-provençal area

and 31% in the Gulf of Lion, and while the overlap with fishery vessels was 91% in the Gulf of Lion and 20% in the Liguro-provençal area. Overall, our results provide science-based information for collaborative management in a multi-purpose landscape shared by humans and animals. This study is part of a larger project (Interact – https://sites.google.com/view/f2finteract/), funded by the Fondation de France, working for a sustainable coexistence between dolphins and human activities on the Mediterranean French coast.

MC24 Study of the interaction events between bottlenose dolphins and the midwater pair trawlers: assessment of the effectiveness of pinger by using the passive acoustic monitoring and photo-identifications technique

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The interaction of bottlenose dolphin (Tursiops truncatus) with fishing activities represents a real economic threat due to the dolphin feeding on the entangled fish, damaging the nets and reducing the catches. Moreover the bycatching phenomenon during the interaction events is one of the major sources of mortality for dolphins the Mediterranean sea. The presented work, performed during the project Bycatch VII 2016-2017, aimed to monitoring the interactions between dolphins and commercial midwater pair trawlers, assessing the effectiveness of interactive pinger (model Did 01) by using an integrate approach: passive acoustic monitoring (PAM) and photo-identifications technique. Data were collected from March to June 2017 on board of commercial midwater trawlers operating in the north-central Adriatic Sea. Eleven surveys were carried out including a total of 51 fishing operations (hauling-trawling-sailing), 25 using the interactive pinger with and 26 without pinger. The acoustic data were collected using an autonomous acoustic recorder anchored to the fishing net. All the observational events of bottlenose nose dolphins included the assessment of group size, young specimens identification, and dorsal fin features using the photo-id method. In total, n 38 sighting events of T. truncatus were performed and 71 specimens (10 calves and 61 adults) were photo-identified. From 28 h of acoustic data collection, the analysis showed 30.555 echolocalization clicks and 841 whistles. About clicks, no signals were recorded during the hauling, 1.570 during the traweling and 745 during the sailing with pingers; on the other hand, without pinger, 366 signals were recorded during the hauling, 23.583 during the traweling and 4.291 during sailing. Mann-Whitney U statistical test showed significant higher number of clicks ($p<0.05$) in tests without pinger during all the fishing operations. Our data confirm that the use of the interactive pinger can influence and mitigate the interaction between bottlenose dolphins and commercial midwater pair trawlers.

MC25 Revisiting Natura 2000 network from a Systematic Conservation Planning perspective: the endangered Mediterranean common dolphin subpopulation as a case study

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Several European conventions and agreements propose the establishment of marine protected areas (MPA) for cetacean as one of the available tools to preserve populations and their habitats. This area-based protection has been mainly driven by the implementation of the Natura 2000 network of MPAs under the Habitat Directive (92/43/EEC). Only bottlenose dolphins and harbour porpoise are listed as cetaceans species that deserve the establishment of special areas of conservation. Nevertheless, other species such as the Mediterranean common dolphins should benefit of area-based protection to face their main threats. Here, we evaluate if the Natura 2000 network is protecting the common dolphins in the Alboran Sea through a systematic conservation approach. Furthermore, we use this endangered species

as a case scenario to understand how the addition of fisheries information may influence the conservation planning output. Overall, our results suggest that the current MPA network largely overlap with the "core areas" for this population protecting 22% of its abundance. However some important gaps in conservation planning are detected at the western side of their distribution. Further, offshore areas are also systematically selected as important areas for common dolphin conservation when fishing effort is included as a cost for conservation. This is because fishing effort at such offshore areas is very low compared to that within main "core areas" for dolphins distribution, so they are "cheaper" to protect. However, these areas represent the marginal distribution of the species and their protection may have undesirable ecological consequences such as the conservation of potentially low quality individuals while harmful interactions would continue in the main "core areas". Owing to the spatial congruence between dolphins and fisheries' distribution, effective conservation actions will certainly have costs on this essential supporting service. Then conservation decision-makers must achieve a trade-off between cetacean conservation and fisheries.

MC26 Striped dolphin coastal population and boat traffic off Antibes: a conservation challenge

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While striped dolphins (Stenella coeruleoalba) are known as oceanic delphinids, they commonly occur in coastal waters of the western Mediterranean Sea, in particular off Riviera. Since the eighties, recreational boat traffic has seen a tremendous increase off Antibes, and striped dolphin local preferred habitat is now boat-crowded about 7 months per year. Boat traffic was monitored from May to October 2017 (five consecutive days per month, seven hours per day) from a shore location in Cap d'Antibes; boat types were recorded in six basic categories ranging from sailboat to motorboat over 30-meter. Boat direction (NE-SW of SW-NE) was also recorded. Dolphin presence was documented using survey sightings obtained by GREC in a recent period (2000-2016): time, location, school structure, and activity pattern data were collected with a consistent protocole. Coastal traffic off Cap d'Antibes varied between 0 and 125 boats per hour, with a total amount of 450 in May, 1166 in June, 1889 in July, 2552 in August, 670 in September and 856 in October, as computed 35 hours survey time per month. Sampling design enabled to show that week-ends were more crowded than average, and that weather had a significant effect on traffic (thus explaining the observed trend in September and October). Two daily peaks were evidenced, whatever the season, the first one late in the morning and the second one in the middle of the afternoon. Archived data included 370 sightings. In average dolphin schools were significantly closer from shore before 10h00 (5.4 km in average, SD=3.1) compared with their distance in the afternoon (9.4 km average, SD=3.6). Dolphins were shown to move back towards coastal waters later in the evening. This study showed a strong co-occurrence of boat and dolphin presence, hence questioning the future existence of wild dolphins in such a touristic area.

MC27 Can human activities influence foraging habitat selection in wild bottlenose dolphins?

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Behavioural studies are essential for defining critical habitat for a population's survival. It is crucial to identify foraging habitats, especially in areas under high anthropogenic pressure, to protect cetacean populations in need of conservation. We present here an innovative study combining behavioural sampling and the use of a multi-model approach to explain which factors drive bottlenose dolphins' foraging activities in a coastal area. Generalized additive models, including both environmental and anthropogenic variables, were used to model bottlenose dolphins foraging behaviour in inshore waters along the southern coast of the Iberian Peninsula (NW Spain), a 450 km2 area with extensive shellfish farming and fishery activities. Data were collected year round from 2014 to 2017, during 273 boat-based observation surveys and covering 9 416 km. Bottlenose dolphins were encountered 712 times and their behaviour was monitored during 445 hours along 2 454 km. Results of this study demonstrated that between the spatial and temporal variables that drive dolphins' feeding behaviour, human activities play an important role. Our findings suggest that shellfish farming areas are for bottlenose dolphins a good value choice, not only in terms of habitat quality, but also in terms of fitness, because dolphins seem to reduce cost and time while acquiring food in these habitats. These results remark the importance of habitat selection studies in order to understand the disproportionate use of habitats that influence survival and fitness of cetacean species and for the management and conservation of cetacean populations in coastal areas.

MC28 The alarming case of the dolphin-fisheries interaction in Thermaic Gulf, Greece

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Reportedly, the Thermaic Gulf in the North Aegean, Greece, hosts among other species of marine mammals, a relatively important and resident population of common bottlenose dolphins Tursiops truncatus. Informal communications with local fishermen complaining on dolphin–fisheries interactions prompted us to conduct a study to shed light into this poorly known dolphin population by taking advantage of fishermen's local ecological knowledge. Between May-October 2017, we interviewed 72 professional fishermen from three main ports of the Gulf, the majority of which (64%) are working as small-scale fishers. The interviewees' average age was 50 years old with an average of 33 years of working experience. Most fishermen (85%) had encountered dolphins in the Gulf. The bottlenose dolphin was the most frequently species reported (60%). The large majority (90%) of small-scale fishermen stated that dolphin-fisheries interaction is their biggest problem with 91% of them reported net damage causing them an average economic loss of 2,723 euros/year. This cost estimated considering exclusively damage to fishing gear, because almost all fishermen were not able to estimate their loss from reduced fish captures or fish damaged by dolphin predation. Alarmingly, 70% of the fishermen recognised to have heard of intentional killings as a retaliation measure against dolphins. It is noteworthy that most fishermen suffering from net damage (80%) are willing to take observers on board for estimating accurately the dolphin-fisheries interaction conflict. The ARIONs database includes 58 dolphin strandings since 2012 in the area, including 12 bottlenose dolphins with unequivocal signs of human-caused death (e.g., entanglement in fishing nets, visible wounds by guns or sharp objects), coinciding with our findings. Priority actions should include producing a reliable bottlenose dolphins' population estimate as well as establishing an inventory of the local cetacean fauna, determining the severity of dolphin-fisheries interactions and identification of the most adequate mitigation measures.

MC29 Creating a whale sanctuary in the Western Indian Ocean: between local normative instruments and international cooperation for a network governance (case study with the "whale route")

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Whales are highly mobile animals, travelling long distances between breeding and feeding sites. They do not confine themselves in a specific area, crossing the water and jurisdictions of multiple nations as well as areas beyond national jurisdiction. As a result, the conservation and the management of these marine species are very challenging requiring interinstitutional coordination, international and regional agreements. As an emblematic migratory species, whales are part of many international agreements dedicated to their conservation and management. However, these legal instruments do not guarantee a full protection of whales and their habitats from direct and indirect impacts of human activities such as pollution, ship strikes, overfishing, entanglement in fishing gear, disturbance or even climate change. Consequently, a project led by Reunion Island (a french territory in the Western Indian Ocean where humpback whales migrate each winter) is under development: the "whale route". Using regional cooperation, this route is intended to protect whales from many anthropogenic disturbances, to encourage their conservation and to raise environmental awareness through sustainable tourism and pedagogical activities. The "whale route" could be set up through a bottom-up approach, by extending existing local law in Reunion (like the whale-watching Charter or the Label for the observation of cetaceans) to a transnational level or through a top-down approach, by concluding a multilateral agreement using Pelagos Sanctuary and Accobams agreement as references. In any case, the "whale route" will necessarily have to be subject to an appropriate governance system. Convention, international organizations, transnational networks are all ways of ensuring the governance of the "whale route", in which public and private actors play a key role. The presentation aims to analyse the challenges and prospects of a regional protected area for whales. It also highlights the cooperation and the coordination required to resolve governance issues.

MC30 The Development of a Network of Local Land-based Surveyors on the Isle of Man

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In 2016 funding was received from the Manx Lottery Trust to develop a network of local land-based surveyors to conduct effort based surveys around the Isle of Man. The two year project was aimed at engaging our local community to become actively involved in cetacean research, therefore contributing to citizen science and developing new skills they otherwise would have to travel abroad to obtain. A total of 5 training workshops have taken place resulting in a total of 76 people having been fully trained. Workshops were split into 2 parts; identification of local species and training in how to conduct effort based surveys from land. After training, surveyors were encouraged to join Manx Whale and Dolphin Watch on live surveys to develop their skills further. Once confident, surveyors were able to conduct their own independent surveys at dedicated sites all around the island. Members of the network have conducted in excess of 200

hours of effort (800 fifteen minute intervals), which included over 100 cetacean positive intervals.

MC31 How to exploit the environmental value of the Posidonia prairies

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The article, doing calculations based on literature data, presents an "order of magnitude" estimate of the economic value of the Ligurian prairies of Posidonia oceanica and gives the guidelines, by means of research and monitoring activities, for the economic exploitation of the environmental resource, through the application of the PES mechanism (Payment for Ecosystem Services) to access to the EU ETS market (European Union Emissions Trading Scheme), regulated in Italy by the GSE (Gestore Servizi Energetici), the state-owned company that manages the CO2 auctions. The importance of the Posidonia oceanica in the maintenance of the ecological and physical equilibrium of the coasts is worldwide known. In Liguria the Posidonia prairies cover around 4800 ha of the coastal areas: the conservation and protection of this ecosystem, obtained by means of wise environmental policies, represents a useful approach for the economic evaluation of the environmental resource. In this paper the value of the Ligurian meadows has been related to the quantity of CO2 stored in the matte: taking into account several extremely variable factors, linked to the carbon concentration stocked and the economic value of the CO2 ton exchanged in the EU ETS system exchange, this value can be estimated between 120 million euros up to 2 billion euros. Developing environmental policies for the protection of the marine and coastal environment, inspired by the Sustainable Development Principles of the marine (Blue Carbon Economy) and coastal (Integrated Coastal Zone Management) environment, it's possible to save economic resources that can be estimated between a minimum of 1 and a maximum of 20 million Euro per year. Even in the case of the minimum, this is a not-negligible economic resource, useful to support the management and the conservation of the protected natural areas, such as the Cetacean Sanctuary, and promote education and environmental protection campaigns.

MC32 Interaction of common, striped and bottlenose dolphins with marine debris in the waters between Algeciras and Gibraltar

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Marine debris affects cetaceans all around the world and it has already impacted at least 200 species. The waters between Gibraltar (United Kingdom) and Algeciras (Spain), northeast part of the Strait of Gibraltar, represent an important part of habitat for common dolphins (Delphinus delphis), striped dolphins (Stenella coeruleoalba) and bottlenose dolphins (Tursiops truncatus). Despite to this biodiversity richness these waters contain high levels of pollution. Data about dolphin interactions with plastic has been collected during the period of six years (2011 – 2017), from aboard a whale-watching platform that runs routinely tours in the studied area. Positioning data, environmental conditions, photographic evidence on focal animal or/and focal group follows were recorded each time possible during sightings. Different types of interaction were observed between these three species of cetaceans and various types of marine debris. Some of the cases described were life threatening for the particular individuals, for example for a common dolphin entangled in a plastic bag or for a striped dolphin with plastic ring around its beak. Meanwhile others served as a tool for an active interaction or as a form of socialising between the individual and other members of the group, by carrying plastic bags or parts of it on their beaks or fins. Without regard to the purpose of interaction with plastic items, marine debris represents a serious hazard to cetaceans. Entanglement of cetaceans is increasing at dramatic speed for past decades, but there is insufficient amount of data either collected or published to point out this threat and improve the understanding and conservation of cetaceans. Therefore the purpose of these observations is to contribute with information about documenting marine debris interaction and entanglement of common dolphins, striped dolphins and bottlenose dolphins in the waters surrounding Algeciras and Gibraltar.

MC33 First marine mammals risk-assessment investigation along the strait of Sicily using fixed-line transects

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The Strait of Sicily is one of the most affected areas by anthropogenic activities of the Mediterranean Sea: maritime

traffic and marine litter are two of the main threats for the population of cetaceans living there. The Fixed-Line-Transect Mediterranean Monitoring Network project aims to evaluate their effects and to monitor the abundance and distribution of marine mammals. In particular, data were collected on board of Grimaldi Lines ferries operating between Palermo and Tunis from May 2016 to May 2017. About 131 hours of observation were undertake in good effort, covering over 2622 nautical miles. Main results showed that the most common sighted species were Stenella coeruleoalba (Meyen, 1833) and Tursiops truncatus (Montagu, 1821), with an average encounter rate (ER) of 0.14 ± 0.03 SE and 0.02 ± 0.01 SE sightings/10km respectively. Delphinus delphis (Linnaeus, 1758), Globicephala melas (Traill, 1809) and Grampus griseus (G. Cuvier, 1812) were instead the less commonly sighted species during surveys. The study area recorded a mean of 16.8 ± 2 SE sighted vessels per effort, and a mean litter density of 1.9 object/km2, 80% of which consisted of plastic materials. Spatial distribution of marine litter and naval traffic were analyzed through a kernel density analysis in ArcGIS 10.5. For the first time accumulation hot-spots of marine litter were overlapped to high density naval traffic areas and marine mammals sightings, in order to identify and spatially contextualize the biotic risk for such endangered species. Seasonal risk patterns were identified and spring and winter resulted to be seasonal hotspots of disturbance, mainly in two areas: the NW coast of Sicily and the central part of the Strait. Although these data were preliminary, they show clear spatial relationship between cetacean presence, naval traffic and marine litter, highlighting the most critical zones as those where multiple anthropogenic stressors occurred.

MC34 A Mediterranean monk seal as votive in the museum of Mycenae, Greece

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The Mediterranean monk seal, Monachus monachus, is the first pinniped studied by man: Aristotle described the species in detail in his Historia Animalium, in 350 BC. Plutarch, Pliny the Elder and other ancient writers also mention the monk seal and Homer describes vast herds of seals lying on the beaches, while Proteus, a sea god, would daily come out of the sea counting them in groups. Today, it is the rarest of seal species and is classified by the IUCN as Endangered. Despite its abundance in ancient times, the monk seal is rarely depicted in ancient art although several marine animals often decorate pottery and votives frequently represent various animals. The only known example of a monk deal depicted in ancient pottery is on a Caeretan hydria from 520-510 BC where the seal is shown swimming behind a sea monster. The monk seal is also depicted on coins from the Greek town of Phocaea in Asia Minor (7th and 6th centuries BC). Most ancient Greek votives include horses, pigs, doves, lions, etc., and are mainly made of bronze, stone or clay. In the Museum of Mycenae, Peloponnesus, Greece, one of the votives exhibited clearly shows the form of a seal: even the stylized fur is visible. It is the Figurine No 12 in the vitrine about «Votives in the archaic sanctuary above the western housing». It was found in the «Agamemnonion religious centre» during an excavation by the British Archaeological School and is dated from the end of the 6th or the beginning of the 5th century BC. To our knowledge it is the only example of a votive in the form of a seal. Unfortunately, no other details are known about this extraordinary finding nor is it clear how and by whom this monk seal votive came to Mycenae.

MC35 Five years of monitoring marine species along Sardinia and Sicily Channel: the threat of marine litter on marine biodiversity

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The conservation of marine biodiversity is the main institutional goal of the Marine Protected Areas (MPAs) and the pollution by marine litter is one of the most serious impacts that threaten the Mediterranean Sea. The MPAs use the legislative instruments (MSFD and Barcelona Convention), supplied by European Commission, to achieve a good environmental status. In this context the MPA Capo Carbonara (SE of Sardinia - Italy) has focused its attention inside the area and on a wider bordering zone. A synoptic multi-disciplinary data collection was carried out on cetaceans, sea turtles and floating marine litter in the Sardinia Channel, between two MPAs, Capo Carbonara (Sardinia) and Egadi Islands (Sicily). The monitoring, coordinated by ISPRA (FLT) and conducted using ferries as platform of observation, was performed during five summer seasons, from 2013 to 2017, along two different routes: Cagliari – Trapani (2013) and Cagliari – Palermo (2014-2017). More than 6000 NM (2013: 1257,41NM; 2014-2017: 5486,35NM) of sampling transects were systematically monitored. The most frequent species of cetaceans (ER=sightings*Km-1)were Stenella coeruleoalba (ER2013=0.54±0.17; ER2014-2017=1.037±0.203), Tursiops truncatus (ER2013=0.1±0.05; ER2014-2017=0.179±0.050)

and Physeter macrocephalus (ER2013=0.15±0.17; ER2014-2017=0.052±0.024); Grampus griseus (ER2013=0.032±0.032; ER2014-2017=0.007±0.007), Delphinus delphis (ER2013=0.03±0.03; ER2014-2017=0.012±0.012), Ziphius cavirostris (ER2013=0±0; ER2014-2017=0.007±0.007) and Balaenoptera physalus (ER2013=0±0; ER2016-2017=0.021±0.015) were sighted occasionally. A high frequency of Caretta caretta sightings (ER2013=4.71±1.42; ER2014-2017=4.375±0.695) were recorded along the route, and frequently associated to the presence of floating marine litter. During the three years (2015-2017) of surveys on floating marine litter the most abundant component detected was plastic (90%), mostly represented by bags, sheets, bottles and polystyrene boxes. Results confirm the ecological importance of the area and the urgent need for improving knowledge on marine biodiversity and its threat (i.e. floating marine litter) in order to obtain baseline information for a better management of the MPAs as well as in the wider bordering zone.

MC36 Problem of the keeping of marine mammals in captivity in Ukraine

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All species of dolphins found in Ukraine are protected by the Red Book of Ukraine, the IUCN Red List of Threatened Species, the Red Book of the Black Sea, and the Convention on the Protection of Cetaceans. The Law of Ukraine «On the Red Book of Ukraine» prohibits their use and catching in business purposes. Keeping dolphins in dolphinariums, on the other hand, is a direct violation of Articles 7, 8 and 25 of the Law of Ukraine "On protection of animals from cruel treatment". Today in Ukraine there are about 20 dolphinariums which keep more than 80 dolphins, beluga whales and seals. The Black Sea Bottlenose Dolphin is the only Ukrainian dolphin that can survive in a dolphinarium. Also dolphinariums buy dolphins Tursiops aduncus from Japan. In 2010 and 2013 Ukrainian dolphinariums network "NEMO" bughty 36 dolphins from Japan. A group of environmentalists advocate such requirements: establishing an effective control system of monitoring animal rights, ensuring appropriate conditions for the keeping of wild animals in captivity, prohibit keeping marine mammals in captivity, closing step by step all dolphinariums in Ukraine and turn dolphins back into the wild (those who can adapt others will live forever in normal conditions in the center) in Ukraine, creation of a rehabilitation center for marine mammals. To prohibit the sale and use of fishing nets, which are hazardous to dolphins. To research the actual state of dolphins in the Black Sea and the Sea of Azov, to discover major threats to the populations of dolphins and how to reduce these threats; creation of the marine protected areas. Also it must be decisions on the European level.

MC37 Use of ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP) to monitor stripped dolhpins (Stenella coeruleoalba) in the Balearic Islands

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Some of the cetacean monitoring programs designed to assess the Good Environmental Status of the European marine waters within the Marine Strategy Framework Directive (MSFD), will only be possible carried out once or twice during each 6-year revision period, due to economic and logistic limitations. Fish assessment surveys are carried out annually or every two years, so they would potentially supply additional information in between the specific surveys for cetaceans. Since 2010, ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP) is conducting aerial surveys during the peak of the Bluefin tuna spawning period in the Mediterranean, for abundance estimations of this tuna species. Apart from Bluefin Tuna, data on other big fish, cetaceans and sea turtles is collected. In this work abundance estimates of stripped dolphin (Stenella coeruleoalba) in the Balearic Islands during 2015 and 2017 are presented. The best fitted model was Hazard-Rate with no adjustment terms, truncation distance at 1100m, observer type and subjective conditions as factor covariates. The abundance estimates obtained for 2015 and 2017 in the area were 27386, CV= 0.50, IC95%= 10715-69994, and 34688, CV=0.08, IC95%=29751-40446 respectively, with an average estimate of 31513, CV=0.17, IC95%=22382-44,370 individuals. Methodological issues, the inclusion of unidentified dolphin sightings to adjust the detection function, and the effect of the different sightability conditions between aircraft sides upon the abundance estimates are discussed.

MC38 Middelfart Listening Station – a successful story of a joint effort between multiple stakeholders

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In spring 2017 a collaborative project was launched between Seiche Ltd., Aarhus University, Nature Park Lillebælt and the Middelfart municipality to design and install a live seabed-to-land hydrophone system for both research and public outreach purposes. The hydrophones were placed in the proximity of an artificial reef in Little Belt, Denmark. The reef is part of the Nature Park Lillebælt, an area with one of the highest densities of harbour porpoises in Europe. It is also one of the three vessel routes into and out of the Baltic Sea, and so represents a substantial source of anthropogenic underwater noise. This live, acoustic monitoring station consists of two hydrophones and underwater cameras on a pyramidal frame, set on the seabed in 12 m depth of water; a 200-m cable to the land-based signal processing equipment; internet connection; a webcam overlooking the surface of the reef area; and an AIS receiver. A public exhibition is open at all times on the adjacent waterfront and displays a live feed of harbor porpoise detections and noise measurements, webcam pictures and AIS tracks of the ship traffic. All information is also transmitted to a live YouTube channel. Live audio is streamed from the system, in which harbour porpoise echolocation is transformed to audible frequencies and mixed with the ambient soundscape of passing vessels, etc. The main purpose of this collaboration was to create an online platform for public awareness and conservation of harbour porpoises; to collect data on harbor porpoise utilization of the artificial reef; and to investigate the potential effects of vessel noise on porpoise behaviour. Here we present the first year of continuous data on detection rate diurnal pattern and the utilization of the reef from the observed feeding buzzes.

MC39 Dzharylgach: a newly discovered important area for cetacean conservation in the north-western Black Sea

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Waters around the Dzharylgach (Jarilgac) Island in the Ukrainian north-western Black Sea are shallow, covered by ice in winter, and this area was considered as marginal for cetaceans; however, there were reports about cetacean aggregations in it. Therefore, an initial research was conducted in 2016-17. It included photo identification cruises, two linear transect surveys of density and abundance in the Dzharylgach Gulf and the northern Karkinit Gulf (total area 259 sq km), and monitoring of strandings. Three cetacean species, the harbor porpoise, the common dolphin and the bottlenose dolphin, regularly occurred in the area during the summertime. The harbour porpoise was the most abundant species, and its recorded density in the Dzharylgach Gulf (1.5 porpoises per sq km), even if being an occasional record, was among the highest in the whole Black Sea. Both bottlenose and common dolphins formed summer resident groups in the area, with individuals regularly re-sighted across two summer seasons. Both species showed mating behaviour and in about 30% of sightings were recorded with neonates and calves. Common and bottlenose dolphins tended respectively to the Dzharylgach and the Karkinit Gulf. In particular, bottlenose dolphins (n = 31-44 individuals) showed site fidelity for waters east and south to the Dzharylgach Island, and they were distinct in specific, unusual game and hunting behavior. Also, noticeable was the presence of common dolphins (about 50-150 individuals) in the extremely shallow Dzharylgach Gulf. Thus, the Dzharylgach Gulf and waters south to the Dzharylgach island, <10 m deep, is a newly discovered important cetacean summer habitat where cetaceans forage, reproduce and stay with neonates. It can be a critical habitat for a local group of bottlenose dolphins. It is recommended to include these waters into a marine protected area, with special recommendations for shipping and fisheries.

MC40 Do whale watching activities positively impact Tarifa village? A case of study in the Strait of Gibraltar

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Touristic whale watching (WW) is the most profitable activity based on cetaceans worldwide. In Spain, WW is concentrated in the south where Tarifa (Strait of Gibraltar) is the main departure port with four operators. Using the vessels of the WW operator "TURMARES Tarifa", 274 semi-structured questionnaires were randomly distributed to and compiled by the Spanish-speaking passengers. Information was collected between April and September 2017 during the final part of each WW trip. To examine the potential benefits for the area arising from WW, we investigated the profile of the customers, the typology of their spending, their viewpoint on the WW practices, on the conservation status of cetaceans and the Strait, and, finally, their overall level of satisfaction with the WW experience. Results show that the 57.7% of interviewees reached Tarifa exclusively to join WW. Alongside WW, hospitality industry most benefits from the presence of WW tourists, with the 70% of respondents spending between 20 and 30 euros each per day. Despite Tarifa being an important destination for water sports, tourist expenses were mostly allocated towards shopping and recreational activities. The majority of the interviewees reported high satisfaction with the WW experience and half of them stated their willingness to economically contribute towards cetaceans' conservation. The results highlight a positive economic impact of WW activities on Tarifa. WW activity helps the economy of the area, supports cetaceans' conservation and offers a touristic service of high quality. This can potentially, in turn, further strengthen ecotourism and whale WW good practices, and therefore a more sustainable use of the resource. It strongly suggested, hence, including WW stakeholders in the transversal process towards a sustainable management strategy of the Strait of Gibraltar.

MC41 Understanding and reducing marine mammal tourism disturbance; the UK situation

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Cetacean and seal watching, both commercial and recreational, is known to cause a range of disturbance reactions including avoidance, changes in behaviour, increased respiration rates, or an increase in vigilance. Such reactions can lead to short term reductions in fitness, such as a decrease in foraging rates or an increase in flushing rates from haul out sites (e.g. during the moulting or pupping period), potentially leading to a decrease in the long term health of the animal, a separation of mothers from pups or a decline in abundance. Commercial marine mammal watching is growing in popularity in the UK, and the rise in recreational activities occurring around the UK coastline means incidences of disturbance appear to be increasing. There are no specific legislation, regulation or licence requirements for commercial wildlife watching operations or recreational activities in England and Wales (aside from general protection from disturbance provided within EU Habitats Directive legislation), whereas Scotland does have legislation to protect seals from disturbance at nationally designated haul out sites. Voluntary guidelines or codes of conduct exist in certain regions of England and Wales, while Scotland has an overarching code of conduct. The UK conservation agencies, together with Regulators and NGOs recognise that incidences of disturbance are increasing, there is little legislation/regulation to protect marine mammals and that there is a disparity in the way that regions of the UK are managing disturbance issues. We are therefore working together to define and reduce the problems being experienced in the UK. We review the types of disturbance incidences occurring around the UK and compare approaches currently used in Scotland, England and Wales to address them. Using case studies, we evaluate possible solutions including legal, educational and outreach options, with a view to creating an overarching plan with recommendations for implementation.

MC42 CMS COP12 – Advancing towards a holistic conservation policy for marine species

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Since its inception in 1979, the Convention on the Conservation of Migratory Species of Wild Animals (CMS) has produced many resolutions, recommendations and decisions that contribute, one way or another, to the overall goal of conserving species with an unfavourable conservation status and their habitats. Of course, threats and issues have changed over time, or are better understood today. The marine species-related outcomes of the 12th Meeting of the Conference of the Parties to CMS (COP12), which took place in Manila, Philippines, 23-28 October 2017, address a wide range of issues. These range from ways to address long-standing problems such as bycatch to managing increasing threats such as recreational interactions from boats or in-water. The resolutions and decisions also mandate work on the emerging research field of animal culture and its implications for conservation. The authors outline the range of actions foreseen for governments, the CMS Scientific Council and the wider scientific community, civil society and the CMS Secretariat in the resolutions and related decisions adopted that are directly relevant for marine species, covering Important Marine

Mammal Areas (IMMAs), marine noise, aquatic wild meat, live captures of cetaceans, in-water interactions, marine debris, conservation implications of animal culture, bycatch, and boat-based wildlife watching. In addition, an action plan for whales in the South Atlantic was adopted, and three species-/population-specific "concerted actions" agreed by Parties, which outline concrete steps that will be taken with respect to Sperm whales (Physeter macrocephalus) of the eastern tropical Pacific, Atlantic Humpback dolphin (Sousa teuszii) and Humpback whales (Megaptera novaeangliae) in the Arabian Sea. Further, the role of different actors in bringing issues relevant to the conservation of wildlife to the attention of CMS is explored, both to support future decision making and to facilitate implementation of the agreed actions.

MC43 Ship strike risk for blue whales *(Balaenoptera musculus)* in northern Chilean Patagonia is a growing concern

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In 2014, we began a project focusing on the ecology, foraging and acoustic behavior of blue whales (Balaenoptera musculus) in Northern Chilean Patagonia. Our aim was to deploy suction-cup attached digital acoustic tags (DTAGs), combined with visual/radio tracking and photo-identification. During our cruises we also collected data from biopsies (genetics and stable isotopes), prey sampling, morphometric sampling, and active and passive acoustic monitoring. We now have 130 hours (21 tags) of dive data from 4 separate cruises. Foraging blue whales were found to dive to significantly greater depths during the day (mean depth of 24.2m, n=15 tags) than during the night (mean depth of 8.9m, n=9 tags; $p<0.01$). Shallow nighttime dive behavior suggests that blue whales may be at increased risk for ship collisions at night. Northern Chilean Patagonia has seen a large increase in ship traffic in recent years due to the booming salmon aquaculture industry (Chile is the second largest producer of farmed salmon in the world) and to the tourist/passenger ship trade. While most vessels serving the aquaculture industry are small and travel at average speeds of 12-14 knots, passenger vessels sailing from Puerto Montt to southern destinations such as Punta Arenas, Cape Horn, Antarctica travel at higher speeds (18-20 knots). These ships pose a strike risk for blue whales, especially at night when whales are feeding very close to the surface. In addition, passenger ship traffic peaks during the austral summer, which is the season with the highest density of whales feeding in the area. Three deadly strikes with endangered baleen whales have been documented in the past 8 years. Our data may be valuable for policy decisions regarding ship traffic and protection measures for blue whales in Chilean northern Chilean Patagonia.

MC44 Influence of boat tourism on the behavior of beluga whales (Delphinapterus leucas) of the Solovetsky Island, Onega Bay, White Sea

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The studies were carried out based on regular observations of belugas of Solovetsky gathering from 1995 to 2015. To assess the impact of boats on variability of belugas' behavior, there were defined three periods of ecotourism development: 2-3 boats weekly; 1-2 boats daily; many boats daily. Boat activity in the water area of Solovetsky gathering was ranked into several types: Boat is outside the gathering (passes along or stays near the gathering border). Boat is in the gathering: (anchored in, goes, or drifts through the aquatory of gathering). Four categories of behavioral responses were described: no reaction; diving; part animals leave the aquatory; all of the observed animals leave the aquatory. In the first period, beluga whales response to all types of boat activity. Any boat presence in the gathering couses a strongly pronounced reaction in belugas, which is accompanied by leaving the water area. During the second period the total frequency of the negative reactions in situations "boat outside" became significantly less (10.5% vs. 36%, P1-tail = 0.03). On the contrary, the beluga whales' response to boats in the gathering still remained. In the third period, there are almost no reactions to boat outside the gathering. The factors of boat presence in the gathering area remain the most influential ones. Change in frequency of reaction absence compared with the second observation period approached significance level (21.8% vs. 11.3%, P1-tail = 0.06). However, frequency of reaction # 1 in the third period is significantly higher than in the first period (21.8% vs. 2.5%, P1-tail = 0.001). It should be emphasized that boats' appearance in water area of Solovetsky gathering in most cases still disturbs natural behavior of beluga whales. Avoiding of the boats, belugas shorten the duration intra-species individual contacts. It may have to negatively affect the animals' breeding success.

MC46 Acoustic deterrent devices as a possible solution for reducing depredation of artisanal gill nets by bottlenose dolphin *(Tursiops truncatus)* in the Aeolian Archipelago (Italy)

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Acoustic deterrent devices (pingers) have been proposed as a possible solution for reducing depredation of artisanal gill nets by bottlenose dolphin Tursiops truncatus in different Mediterranean areas. This study tested the effectiveness of FishTek Banana Pingers® on set gill net, encircling gill net and trammel net in the Aeolian Archipelago (Italy). Forty-two trials were performed from April-July (2017) and an experimental net fitted with pingers and a control net (at distance of 400 meters) were set for each trial. Seven pingers for each net (length 450 meters) were located in the line of corks. The depredation rate was assessed by comparing weight and composition of catch, catch damage and net damage between control and pingers nets. The economic damage for fisherman was also estimated using the price per kg for species. Damages to net and catch were observed in set gill net and trammel net without pingers. The catch was significantly smaller in control than pingers nets ($p < 0.001$). An increase of 11.74 kg (trammel nets) and 6.26 kg (set gill net) was observed for fishing session with pingers. In particular, for trammel nets, M. surmuletus, P. phycis and S. maena, that are the main target of the bottlenose dolphin diet, were higher in pingers than control nets ($p < 0.01$). This catch corresponded to an increase of 535.60 € (mean increase of profit for test = 53.56 €) in the profit. The sale of non-target species (S. cretense, S. sphyraena, T. picturatus, S. tinca) may be used as compensation method. Our results showed that pingers may be a useful for reducing dolphin depredation on set gill nets and trammel nets, but more specific tests are needed to verify their effectiveness in other fishing periods and if dolphins settle into pingers for a long period.

NT NEW TECHNIQUES

NT01 Non-mammal marine macrofauna: a usable clue during cetologic fieldwork?

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Cetacean-aimed field research involves sea surveys, which are mainly designed to focus on those mammals. During fieldwork, observers often see non-mammal aquatic animals, but these sightings are frequently perceived as anecdotical and not used within main carried studies. In this work we tried to estimate whether non-mammal marine macrofauna observations were related to cetacean sightings. We used data gathered from sailboat surveys carried with a consistent methodology during two consecutive years (2016 and 2017) in the Northwestern Mediterranean Sea. We first separated the data into 159 sessions of continuous transect lines. Each of these sessions contained a certain amount of non-mammal marine macrofauna sightings (birds aggregations, turtles, fish and invertebrates aggregations) and a number of cetacean observations. A Spearman test revealed a positive correlation ($p \approx 0.0001$) between the two variables. We then explored more accurately this correlation by estimating, within each prospection session, the spatial co-occurrence of the two sighting categories. For each observation, we checked whether a sighting of the symmetrical category occurred less than one nautical mile away ([+/+] event) or not ([+/-] and [-/+] events). This method allowed us to draw a contingency matrix that confirmed (Chi-squared test, $p \approx 0.002$) a positive correlation between non-mammal marine macrofauna and cetacean sightings. One could expect this correlation to be more significant when concerning (relatively) low-depth foraging cetaceans (example of the fin whale), and almost absent for deep-diving ones (e.g. sperm whales). To test this hypothesis, we carried out processings using previous method but reducing cetacean sightings dataset to single species. We applied this process for striped dolphins, Sc, sperm whales, Pm, and fin whales, Bp. The positive spatial correlation appeared to be loose for Sc (Chi-squared test, $p \approx 0.063$), quite uncertain for Pm (Fisher's test, $p \approx 0.38$) and strongly significant with Bp (Fisher's test, $p \approx 0.0083$), thus validating our hypothesis.

NT02 The possible use of unmanned aerial vehicles (drone) to collect informations on wild cetaceans health status

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In the last years, Unmanned Aerial Systems have been extensively used in various research studies on vertebrates because they can provide an affordable and portable platform for aerial surveys regarding animal habitats and possible threats. However, the use of drones for studying and monitoring cetaceans is still at an early stage. There are many publications regarding the use of marine mammals as sentinels of ecosystem health using blood samples, that provide an accurate assessment of both individual and population health. We present a preliminary study to assess a standard non-invasive method for sampling and analyzing cetacean blow samples collected using drones. In order to set sampling and analytical methods on blows, a series of blow samples from a group of 6 under-human-care bottlenose dolphins (Tursiops truncatus) located at Acquario di Genova were collected using both Petri dishes and 6-well plates, positioned at different heights over the animal's blowhole. Total DNA extraction from blow samples has been performed with two different methodologies: by pressure filtration method, using commercial kits following manufacturer's instructions and with TRIzol Reagent following the supplier's protocol. The obtained nucleic acids were quantified using NanoDrop 1000, amplified employing PCR technique and sequenced. Subsequently, the same sampling kit, assembled on a waterproof drone, was tested on a population of wild bottlenose dolphins living in the Gulf of Ambracia, western Greece. Unfortunately, this kind of sampling, applied to wild small cetaceans, did not provide biological matrix for genetic and pathological biochemical studies. Nevertheless, it was possible to identify the collection of microorganisms (microbiota) present in the dolphins' upper respiratory tract by using 16SIllumina Amplicon Protocol. Our findings indicate that these techniques could identify crucial indicators of the health status of dolphins, and blowhole sampling using drones my pose not only a technological advancement but also and innovative and remarkable approach to wild cetaceans health studies.

NT03 The last remains in marine top predators – simulated stomach content analysis in seals and their limited applicability to porpoises

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Stomach content analysis (SCA) in marine mammals can enrich our understanding of trophic linkages in food webs and predator-prey relationships and potential overlap between fisheries and marine megafauna. Fish consumption is often difficult to quantify due to advanced levels of degradation. Little is known about food degradation patterns in porpoises and sometimes degradation relationships derived from in vitro experiments with seal stomachs have been used as a proxy. However, seals have stomachs of carnivores (one compartment including intestinal glands) while porpoise stomachs have developed from toed ungulates (four compartments, nearly all food remains are found in the first compartment lacking glands). To determine whether degradation observed in seal stomachs can be used as a proxy for degradation patterns in porpoises, we conducted an in vitro digestion experiment simulating the digestive environment of a seal stomach and compared the results with post mortem examinations of porpoise stomach contents (data for pH, pepsin and lipase of porpoise stomachs are not available). The in vitro experiment determined: 1)How do whole fish and otoliths of Sprat, Cod and sandeel degrade over time? 2)Which bone structures degraded at which time? 3)How large are the associated uncertainties? Findings of three replicate trials (30min control intervals with a maximum of 1700min trial duration) indicated that bone structures degraded faster in seals stomachs. Otoliths of sprat started to degrade while the skull was still intact, sandeel and cod otoliths started to degrade after the skull broke apart. The otolith degradation depended on otolith size, but not on species. Post mortem examinations of porpoise stomachs revealed easily identifiable food remains with miniscule structures intact, suggesting minor degradation due to digestive enzymes. In contrast, the simulated seal stomach showed high degradation of bone remains. This suggests that simulated seal stomachs should not be used to correct SCAs of porpoises.

NT05 Southern elephant seals (Mirounga leonina) 'nose- metrics' using image analysis in wild animals

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Geometric morphometrics produced a significant advancement in the study of functional, and evolutionary morphology. It is usually applied to hard tissues, such as bones, and is rarely applied to soft tissues of live animals. The proboscis of

male southern elephant seals (Mirounga leonina) is an impressive secondary sexual trait, whose precise function is still to be determined, although it likely plays a role in the advertisement of breeding status and in the emission of vocalizations during agonistic interactions. The study of this soft tissue structure, is complex because the proboscis should be measured when inflated, and this means on live subjects in the field. We studied southern elephant seals at Sea Lion Island, in the Falkland Island Archipelago. This is a small, well localized population, in which all seals are individually recognized and of known age. In order to obtain the data, we took digital photos of vocalizing males in side view. The picture were shot while an experienced operator kept a pole with a scale bar close to the mouth of the subject, so that it was aligned to the body mid plane. We took three pictures, at different times, for each of 43 males. Then, one operator (MCV) digitized 4 landmarks and 19 semi-landmarks on the photos, including the replicas, and analyzed them using free software, mainly, the TPS series and MorphoJ. We assessed repeatability of the complete configuration of landmarks and semilandmarks. Overall, we found negligible measure errors accounting for ca. 16% and ca. 12% of respectively size and shape variance, thus suggesting high repeatability in relation to inter-individual differences in the sample. To our knowledge this is one of the few studies showing that it is possible to obtain precise landmarks on a soft-tissue in naturally behaving large mammals using 2D images of live subjects.

NT06 Alternative techniques to osmium tetroxide to detect fat embolism in cetacean lungs

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The presence of fat emboli within pulmonary vessels has been described in cetaceans suffering a violent trauma, like ship collisions, or presenting a decompression like sickness in temporal and spatial association with antisubmarine sonar activities. Postfixation with osmium tetroxide in paraffin-embedded tissues is the technique traditionally used to histologically detect these fat emboli. However, its high toxicity together with the elimination of part of the emboli due to the washes with picric acid pose the need to look for different fixation and staining techniques. The objective of this work was to propose alternative techniques that allow an adequate diagnosis of fat emboli in addition to being less toxic. For this purpose, lungs from sperm whales killed by ship collisions were analyzed and treated with osmium tetroxide and two alternative techniques. These two techniques were: 1) Frozen tissue samples, which were preserved in PBS sucrose solution during weeks before being cut with a cryostat, 2) Fixation with chromic acid for tissues embedded in paraffin sections. Chromic acid is less toxic than osmium tetroxide and it has proven to be effective in diagnosing fat embolism in human crushing injuries and atherosclerosis. In both methods, lipids were stained with Oil Red O. Results showed that both techniques detect fat emboli successfully in the lungs and can be routinely used to diagnose fat embolism in cetaceans.

NT07 A novel real-time acoustic monitoring system to assist in mitigation strategies for marine mammals during Dublin Port's Alexandria Basin Redevelopment Project

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The potential impacts of underwater noise on marine mammals are widely recognized. Historically monitoring for mitigation purposes during vessel traffic, pile-driving, marine construction and dredging has generally been conducted by human observers scanning the sea surface for the presence of marine mammals or other marine animals. In recent years, there has been increased interest in other monitoring technologies, such as Passive Acoustic Monitoring in order to address some limitations associated with visual monitoring. A novel real-time ocean observation system ("Observer") has been recently developed and deployed during the Alexandra Basin Redevelopment Project, the largest single infrastructure development project in the history of Dublin Port, Ireland. Two JASCO Observer systems have been deployed onboard two monitoring buoys to the north and middle of the spoil grounds in Dublin Bay. These acoustic monitoring systems automatically detect marine mammal species and send email notification messages to the IWDG Marine Mammal Observers if marine mammals are detected. The acoustic systems are complementary to visual observations and assist in monitoring at night and when visual observation is not possible due to poor weather. Automatic marine mammal detection data is also archived and warehoused using an informatic infrastructure ("PortListen"). C-PODs have also been deployed to autonomously gather odontocete "click" information for comparative purposes. We will describe how the combination of these data collection techniques works to fill knowledge gaps. The number of detections and the information obtained by each method (visual, "Observer", C-POD) will be compared and

discussed. Combining multi-species monitoring methods within a real-time observation system provides a powerful approach for mitigation measures. The outcomes and implications of this project will be discussed.

NT08 X-band radar for the marine mammals tracking

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The continuous monitoring of marine mammals is essential to collect data on the presence and abundance about species of "difficult access", due to the difficulties represented by the natural habitat and the animals behavior too (sea visibility, apnea, surface behavior). X-band radars detect the echo of the electromagnetic signal reflected by an obstacle or a ship (target). Ad hoc algorithms applied to radar data allow to detect , either from vessels or fixed platforms installed along the coast, the presence of small and slow targets also in presence of high sea states. The aim of this work is to test the capability of X-band radars, located in the coast, to detect and track cetaceans in a range of approximately 3 nautical miles from the radar antenna. To this end, we will exploit the X-band coastal radar network implemented in the RITMARE project and which includes several radars distributed along the Italian coast. During the next months we'll select the best site where to start the research activity and we will add to the radar recordings the presence of a marine mammals observer to detect sightings of target species in the area and simultaneously verify the data recorded by the radar. Experiences, studies and research in the East Pacific, the North Atlantic and Japan are known, but for Italy and Tuscany would be the first time that this project would be directly applied. The success of the experiment would represent a new field of study to monitor the presence of marine mammals in the Mediterranean sea, going to support direct data collection and reducing costs. Radar monitoring system could be an effective tool for cetaceans protection, particularly in preventing collisions and boats disturbance.